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(Assisted by several Scientific Gentlemen.)

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No. CCVI.

RECENT PATENTS.

To JOHN PLATT, *of Oldham, in the county of Lancaster, machine maker, and* THOMAS PALMER, *of the same place, mechanic, for certain improvements in machinery or apparatus for making cards, also for preparing and spinning cotton and other fibrous materials, and for preparing and dressing yarn, and weaving the same.*—[Sealed 24th July, 1847.]

THESE improvements in machinery or apparatus for making cards, also for preparing and spinning cotton and other fibrous materials, and for preparing and dressing yarn, and weaving the same, consist, firstly, as regards the machinery or apparatus for making "cards" for carding-engines, in the application and use of bands of "vulcanized India-rubber," to act as springs (in place of the metallic springs and weights ordinarily employed) in such machines. Secondly, in the carding-engine, the improvements consist principally in a certain novel description of compound bracket, for supporting and adjusting the rollers for carding, stripping, or grinding, commonly used in carding-engines. Thirdly, in the employment of bands or strips of vulcanized India-rubber, to act as springs (in place of the metallic springs or weights usually employed for weighting the drawing or other rollers, and for other purposes) in all or any of the machinery or apparatus employed in the preparation and spinning of cotton and other fibrous materials. Fourthly, the improvements refer to the spinning of cotton and other fibrous substances, and consist

in a certain novel adaptation of mechanism for the purpose of forming or producing a "mule" cop in a machine, constructed upon the "throstle" principle; whereby the bobbins ordinarily employed are dispensed with. Fifthly, the improvements consist in the novel application or use of a suitable arrangement of mechanism for the purpose of doffing the finished cops, or removing them all simultaneously from the spindles of mules, instead of taking them off by hand, as hitherto done. Sixthly, as relates to machinery or apparatus for preparing and dressing yarn, the improvements consist in the application thereto of vulcanized India-rubber, to act as springs (in place of weights or metallic springs) in such machinery. Seventhly, the invention refers to improvements in power-looms, and consists in certain novel methods or arrangements of mechanism for regulating the "letting off" or delivering of the warp from the yarn-beam, so that there shall be at all times a regular quantity given off,—thereby insuring the perfect equality of the cloth; and also in the employment or use of vulcanized India-rubber, to act as springs in certain parts of looms for weaving, hereafter described. The application of the first, third, and fourth parts of the invention will be readily understood by the foregone statements thereof; but, in order to shew the practical application of the second and fifth parts of the invention, the patentees have described the same with reference to several drawings.

In Plate I., fig. 1, is a side view of a carding-engine, shewing an improved construction of compound bracket, for supporting and adjusting the "clearers," applied thereto; fig. 2, is a front elevation of the bracket, detached, and on an enlarged scale; and fig. 3, is a side view of the same. *a, a,* is the main framing of the carding-engine; *b,* is the main carding-cylinder; *c,* is the "licker-in" roller; *d, d,* are the "strippers;" *e, e,* are the clearers; *f, f,* are the flats or top cards; and *g,* is the doffing-cylinder. Upon the parts *h, h,* of the framing, which is usually called the "bend," are to be cast or fixed bosses and studs *i, i, i,* one opposite to the end of each stripper and clearer, and also one opposite to the roller used for grinding the doffing-cylinder. The boss and ring are made true with the side framing, and are for the purpose of attaching the brackets for carrying the rollers. The brackets (see figs. 2, and 3,) are composed of two parts; the chair or bottom part *k,* is fitted on to the stud *i,* (having a hole bored out for that purpose), and is capable of swivelling or moving laterally upon the said stud, in order to set the rollers to or from each other; but when adjusted, it is held

firm by means of the set-screws *l*, *l*, acting against the projection *m*, on the bend (see fig. 1.) The upper part *n*, of the bracket, which carries the journal of the roller, is capable of sliding upon the part *k*, in the direction of the radius of the main cylinder, so as to set the rollers nearer to, or further from, the surface of the said cylinder; but it has no lateral movement, and is moved by means of a screw *o*, which is supported in the chair *k*, and works in a nut formed in the lower end of the sliding-piece *n*. The bracket is fixed to the stud *i*, upon the bend by means of the bolt *p*, which passes through a slot cut in the piece *n*, to allow of the piece *n*, sliding. The brackets for supporting the clearers require no lateral adjustment, and therefore in them the set-screws *l*, *l*, may be dispensed with, and the chair *k*, prevented from swivelling upon the stud *i*, by means of a key *q*, (see fig. 1.)

Fig. 4, represents an ordinary mule-spindle, which may be so adapted to the principle of the common throstle-frame for spinning as to allow of a pin-cop being built up or formed upon the bare spindle, as in ordinary mule spinning, whereby the use of bobbins may be dispensed with. This is accomplished by providing the throstle-frame with sets of common mule-spindles *a*, *a*, and adapting thereto a peculiar arrangement or construction of flyer, now well known as the "ring and traveller" flyer, and represented in its relative situation around the spindle at *b*. This adaptation of the spindle and flyer, when combined with any suitable arrangements of mechanism, capable of so regulating the rise and fall of the copping-rail *c*, as to build or form the required shape of cop, admits of mule-cops being spun upon the bare spindle in the throstle-frame. To allow of the thread clearing the upper point of the spindle, longitudinal guide-wires *d*, must be provided between the "front rollers" and the points of the spindles. Fig. 5, is a section of a "mule-carriage," with the improvements shewn as applied thereto; and fig. 6, is a front view of the same. *a*, *a*, is part of the carriage; *b*, *b*, *b*, are the spindles; and *c*, *c*, is a rail (shewn detached in plan view), extending along the front of the carriage, and resting upon the brackets *d*, *d*, placed at suitable distances along the front of the carriage,—which brackets are supported upon the studs *e*, *e*. At the lower part of the brackets *d*, *d*, racks of teeth *f*, *f*, are provided, which are respectively acted upon by toothed segment-wheels *g*. When it is desired to "doff" the cops, the handle *h*, is turned upwards, which will cause the cranks *i*, *i*, to force the rail *c*, *c*, under the bottoms of all the cops

between the teeth need not be perfectly parallel, but may be wedge-shaped; that is, diminishing in width toward the back part. A requisite number of these thin metal rings, according to the length of the cylinder, shaft, or mandril to be employed, having been prepared as described, they are to be slidden on to the cylinder, shaft, or mandril, with a collet or plain ring, of smaller diameter, between every two toothed rings, and are then made fast, in close contact with each other, by end cap-pieces, as shewn in fig. 1. One of these intervening rings is represented at fig. 3; they are made by flattening a piece of wire to the desired thickness to form the spaces between the toothed rings, and then bending them to the circular form. Fig. 4, is the end view of the burring-cylinder, shewing the arrangement and construction of the teeth. The notches between the teeth, and the spaces between the toothed rings, are to be sufficiently wide to receive the fibres of the wool or other material, and hold them within the periphery during the burring operation; but so narrow as to exclude the burs or other rough matters that may be attached to the fibres,—holding such coarse impurities beyond the periphery of the toothed-cylinder, in order that they may be knocked or stripped off from the fibres by the action of rotary-beaters. A cylinder so formed will thus have recesses all over its surface, to admit the fibres; but those recesses will be so small, that the burs, motes, and other extraneous matters, will remain on the outside of the cylinder, in positions suitable to be knocked off by the rotary-beater, stripper, or clearers. The novel kind of beater is a corrugated cylinder, represented in section at fig. 5, and in front view, in its place in the machine, at fig. 1. A plain metallic cylinder or shaft, of suitable diameter, being provided, semi-cylindrical pieces of thin metal (as tin plate) are to be attached, longitudinally, round the periphery of the cylinder or shaft, the concave surfaces of the semi-cylinders outward, and their outer edges soldered together, for the purpose of forming the plain edges of a fluted or corrugated cylindrical surface. These semi-cylindrical pieces of thin plate-metal must be securely attached to the shaft by solder, or otherwise, and their outer edges, when united, made perfectly smooth, even, and equidistant from the axis of the shaft or cylinder. The beating or clearing-cylinder being thus made, it is to be mounted in the machine parallel to the toothed cylinder just described, and their distance apart carefully adjusted, to suit the condition of the material to be operated upon. The two cylinders, that is, the toothed cylinder *b*, holding the fibres of the material

in its recesses, with the burs or motes sticking round its periphery, and the beating-cylinder *a*, (their peripheries being placed nearly in contact) must then be put into rapid rotary motion, in opposite directions, when the revolving-beater will strike off all the extraneous matters from the surface of the holding-cylinder, and the wool or other material will thereby become cleaned from its impurities. In fig. 1, *g, g,* represents toothed portions of the wool-holding-cylinder, on which the toothed rings and their intervening collets are mounted, and made fast at their ends by cap-pieces *e, e*. The parts *d, d,* represent the standards of the machine, on which the boxes *c, c,* for carrying the axles of the two operating cylinders *b*, and *a*, are mounted. These boxes are made to slide in slots, for the purpose of allowing the cylinders to be adjusted according to their required distances apart. *f, f,* are pulleys, the one on the shaft of the holder or toothed cylinder *b*, the other on that of the clearer or beating-cylinder *a*, by which the said cylinders may be severally driven, in opposite directions, at the required speeds, by bands from a first mover. By the mode described of constructing the cylinders, the fibres of the wool, under operation, will be drawn into the teeth of the rings, and into the spaces between the rings, and be there protected from the rotary-beaters or clearers; which will only be allowed to act on the burs and motes beyond the periphery of the holding-cylinder; and the impurities will thereby be separated without injury to the fibres. This machine may be used without the carding-engine, if a cylinder with points or bristles, or some such contrivance, be employed as a doffer or stripper, to take the fibres from the teeth of the holding-cylinder, after they have been cleared of the impurities.

The patentee claims, Firstly,—the construction or mode of making the holding-cylinder, by combining a series of toothed rings, of the form described, or series of such teeth set in the form of rings round a cylinder, with recesses or spaces between the several rings or circles of teeth, and between the teeth themselves, sufficiently large to receive the fibres, and yet so small as to exclude the burs and other coarse impurities; and, Secondly,—the method of making the beaters or clearing-cylinders, by combining a series of segments of cylinders, arranged round the periphery of a shaft, in lines parallel with the axis, and securing such segments, in the way described, upon an internal cylinder or shaft, so that their outer edges shall project, and be perfectly true and parallel to the axis.—[*Inrolled October*, 1848.]

To JAMES PARKER PENNY, *of Clarendon-place, Notting-hill, in the county of Middlesex, for certain improvements in obtaining copper from copper ores,—being a communication from abroad.*—[Sealed 26th May, 1848.]

THESE improvements relate to the smelting of those descriptions of ores of copper known as the carbonates and oxides, by means of leaves, chips of wood, charcoal, and similar carbonaceous matter, whereby the use of the ordinary fluxes may be avoided, and the carbonates and oxides decomposed at one operation. The furnace employed for this process is very similar to the melting or reverberatory furnaces in common use at Swansea and Holywell, the difference only being that the crown has a greater proximity to the bed or bottom of the furnace, for the purpose of concentrating the heat upon and keeping the flame effectually in contact with the ore. The fire-place is of somewhat larger dimensions than usual, to allow of a greater bulk of fuel when wood is used. The ore to be melted is broken into pieces, or ground, as may be deemed most convenient. The furnace having been raised to a sufficient temperature, ordinarily described as a white heat, the ore is introduced through an opening in the crown, and evenly distributed over the floor of the furnace. When the ore is in a state of fusion, leaves, chips of wood, charcoal, or other similar carbonaceous matter are thrown in and mixed with the fused mass, whereby the decomposition of the ore is effected; care being taken to employ a sufficient quantity of carbonaceous matter for that purpose. Or the carbonaceous matter may be mixed with the ground ore, and introduced with it into the furnace, instead of separately, as already described, when the ore is broken into pieces. The decomposition of the ore having been effected by this means, the copper, separated from its compounds, is received in a cavity in the bed of the furnace, and may be tapped and run into moulds, by drawing out a plug in a hole in the cavity. This process having been completed a second charge may be introduced, and the operation above described repeated; the scoria or other extraneous matter being removed from the furnace as occasion may require.

The patentee claims the decomposition of carbonates and oxides of copper by the use of leaves, chips of wood, charcoal, and other similar carbonaceous matter, in the process of smelting such ores, as above described.—[*Inrolled November,* 1848.]

To Alfred Vincent Newton, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for an invention of improved machinery for manufacturing shot and other solid balls,—being a communication.*—[Sealed 31st January, 1848.]

This invention of improved machinery for manufacturing shot and other solid balls, as communicated to the patentee, is clearly set forth in the following description; reference being had to the figures in Plate III. Fig. 1, represents the improved machine in plan view; fig. 2, is a side elevation; and fig. 3, a longitudinal vertical section of the same; fig. 5, is a bottom view of the die-holder; figs. 6, and 7, are longitudinal vertical sections of the die-holder, and the parts connected therewith, taken at the lines A, *a*, and B, *b*, of fig. 1; fig. 8, is a face view of the grooved disc, for rolling the balls; and fig. 9, is an elevation of a modified arrangement for rolling the balls, with part of the outer case removed.

The first part of the invention consists in forming shot or other balls from lead, by cutting the required quantity of lead for each ball or shot transversely from a bar, which is made wider and thinner than the intended diameter of the shot to be produced (the piece to be cut being of less length than the diameter of the ball to be produced): by means of which balls or shot can be formed of solid lead by compression, by cutting from a bar of solid lead, without leaving scraps.

The second part of the invention, which relates to the machinery for making shot or other balls of lead in the solid state, consists of a cutter or punch and swage, the end of which is formed with a semi-spherical cavity; the periphery of which constitutes a cutting edge, to sever the lead from the bar, when this is combined with a die, made with a cylindrical cavity to receive the punch, and with a semi-spherical bottom, in which the lead is forced by the punch to form the shot by compression; the die being provided with a discharge-pin or follower, which slides in a hole made in the bottom of the die for the purpose of forcing out the shot after it has been formed.

The third part of the invention consists in making the die or the punch with a small hole leading out from some part of the semi-spherical cavity thereof, for the purpose of admitting of the discharge of any surplus lead when, by the irregularity of the bar of lead, or of the action of the machine,

a greater quantity of lead is cut off from the bar than is requisite for the formation of the shot.

The fourth part of the invention consists of a plate, the face of which is formed into a volute groove, running from near the centre to the periphery thereof, combined with a corresponding and rotating face-plate without a groove, for the purpose of smoothing the surface of balls or shot as they are discharged from the cutting and swaging part of the machine.

The last part of the invention relates to a modification of the mode of rolling the balls, and consists in passing them through a spiral groove formed on the periphery of a conical block that turns within a casing of corresponding form, without a groove, and lined with leather; the case and block being made adjustable to one another.

In the drawings *a,* represents the main plate of the machine, properly sustained, and connected by standards *b, b, b,* with the foundation-plate *c.* The main plate *a,* is provided with two guide-pieces *d, d,* properly secured thereto; their inner faces being made parallel, and suitable for guiding the punch-carrier *e,* which slides on the main plate and between the two guide-pieces; it being held down by metal straps or plates *f, f,* secured to the pieces *d, d.* The punch-carrier *e,* is a square bar of metal, with its opposite faces parallel, that it may move steadily, and yet with ease, on the bed-plate and between the guide-pieces; and at about one-third of its length from the rear end it is cut out, as shewn at *g,* that it may slide over the main shaft *h,* without coming in contact with it; and the part cut out is strengthened by two curved cheeks *i, i,*—the space between them being sufficiently large to admit of the working of the main cam to be presently described. The main shaft *h,* which is mounted in boxes *j, j, j,* on the main plate and the guide-ways, is placed with its axes at right angles with the punch-carrier; it carries a cam *k,* which works in between the two cheeks of the punch-carrier, and, in its rotation, alternately acts to move the punch-carrier backwards and forwards to the required distance; a friction-roller *l,* for the face of the cam to act against, being interposed and adapted to the punch-carrier at either end of the opening in which the cam rotates. In this way the punch-carrier receives the required movements by the rotation of the main shaft, which is rotated by a belt *m,* from some prime mover, passing around a pulley *n.* The punch *o,* made of well-tempered steel, is cylindrical, and of a diameter equal

to the intended diameter of the shot or balls to be made. At fig. 4, this punch is shewn on an enlarged scale; its forward end, it will be seen, is hollowed out to the form of a semi-spherical cavity, to give the requisite rotundity to the shot; the edge of this cavity constitutes a sharp circular edge, to cut off from a bar the quantity of lead required for each shot or ball: the rear end of the punch is fitted in a hole in the forward end of the punch-carrier, and is there secured by a temper-screw *p*. Care must be taken to have the axis of the punch precisely in the line of the motion of the carrier. For the purpose of regulating the position of the punch relatively to the die, that it may move up to the required distance to form a spherical ball, there is a wedge o^2, fitted to slide vertically in a hole in the punch-carrier; and, just at the back of the punch, the said wedge is let in from the under side, and provided with a set-nut o^3, above, by which the wedge can be drawn up or let down; and in this way the position of the punch may be determined. The die-holder *q*, is a block of metal, secured by screws *r*, *r*, to the main plate and between the guide-ways, to ensure its being in a line with the punch-carrier. The bar of lead *t*, is introduced, horizontally, through a hole t^3, in the side of the die-holder, which has a hollow space *u*, between the punch-guide u^3, in the forward part of the die-holder and the face of the die; and the bar of lead, instead of resting against the die when being cut by the punch, rests against a lip *v*, which constitutes the permanent shear in the operation of separating a piece of lead by the punch. Between this lip and the face of the die there is an open space, in which a discharger *x*, slides vertically. The discharger is forced down by a lever *y*, attached to its upper end, and turning on a fulcrum pin y^2; it is struck, at the required time to depress the discharger, by a small cam y^3, on the main shaft,—the said discharger being forced up at the required time by an inclined plane *z*, (fig. 7,) on a bar a^1, let into, and fastened in, a groove in the under surface of the punch-carrier, and sliding in a like groove in the die-holder; so that when the die is carried back, after having formed a shot or ball, the inclined plane *z*, slides from under the discharger, and permits it to be forced down by the lever *y*, so that a lip or projection of the discharger shall strike the shot, and ensure the discharge of it from the die into a hole c^1, in the main plate. The die should be made of good cast-steel, with the forward end formed into a cylindrical cavity d^1, the bottom of which is semi-spherical, to correspond with the form of the cavity in the end of the punch; so that when the

punch is inserted in the cylindrical cavity of the die, which it should fit, the two will constitute a spherical matrix to form the shot. This die is either formed by cutting out the solid metal of the die-holder, or may be made separate, and let in from the back into a hole adapted for it in the die-holder. The back of the die-holder is provided with a securing and set-screw e^1; so that, by the turning of the set-screw, the position of the die relatively to the motion of the punch can be set with the greatest nicety. The drawings, however, represent the die as being made out of the solid metal constituting the die-holder. There is a hole bored through the set-screw and the die, in which a follower f^1, is fitted and slides; and the end of the follower, when in place, constitutes a part of the semi-spherical socket. To prevent the follower from being forced back too far, it has a shoulder, which comes against the end of the set-screw, that its position in the die, when forced back, shall be such as to form a part of the bottom of the die. The object of this follower is to force the shot or ball out of the die after it has been swaged; and, for this purpose, the forward end of the bar a^1, that is attached to, and moved by, the punch-carrier, is turned up, or formed with, a shoulder g^1; so that, on the back motion of the punch, it shall force forward the follower, and push the shot or ball out of the die; but as the shot sometimes adheres to the end of the follower, the back motion of the bar permits the discharger to descend and deliver the shot out of the machine through the hole c^1. The bar of lead, made of the requisite thickness and breadth, as stated above, and of any desired length, is introduced between two fluted feed-rollers i^1, i^1, (see fig. 2,) mounted on two parallel arbors j^1, j^1; the lower one turning in permanent bearings, and the other one having its journals in boxes that slide in standards k^1, k^1, provided with set-screws l^1, l^1, that the distance between the feed-rollers may be regulated at pleasure. The lower one of these arbors has a bevil-pinion m^1, on one end, which engages with a like bevil-pinion n^1, on a short arbor o^1, parallel with the main shaft; and this arbor has a ratchet-wheel p^1, on it, the teeth of which are struck by a spur q^1, on the main shaft, at each rotation, for the purpose of turning the feed-rollers, to feed in the bar of lead to the required distance to supply the requisite quantity of lead for each shot or ball. In the semi-spherical cavity of the die there is a small hole r^1, leading to a discharge-hole s^1, in the main plate, through which the surplus lead is discharged whenever, by the irregularity of the bar of lead, or of the working or imperfect adjustment of

the machine, the piece of lead cut from the bar is larger than is required to form a shot or ball. When the shot is discharged from the die, it passes down the hole r^1, made through the main plate, and through the face-plate f^1, shewn detached at fig. 8. The face-plate is provided, on its under surface, with a volute-groove s^1, which commences at the discharge-hole r^1, a short distance from the centre of the plate, and extends to the periphery thereof. The cross section of this groove should present a semi-circle, or a little more if desired. Below this plate there is a disc t^1, which receives the shot when they fall down the passage r^1. This disc is of the same diameter as the plate f^1, the two having their centres in the same line; and the disc is attached to the upper end of a vertical shaft u^1, the upper journal of which runs in a box in the centre of the grooved plate, and the lower one in a box x^1, fitted loosely in a socket y^1, provided with set-screws z^1, all around, for the purpose of adjusting the face of the disc to the face of the grooved plate, and making them work parallel. A vertical screw a^2, is also provided below, to elevate or lower the disc, to adjust its distance relatively to the groove-plate, that any required pressure may be given to the shot in passing along the groove. The face of the disc is covered with leather; and it is rotated by a belt b^2, from a pulley c^2, on the main shaft, passing around guide-rollers d^2, d^2, and thence around a pulley e^2, on the shaft of the disc. By the rotation of this disc the shot or balls, as they are discharged from the die, enter the volute-groove at the centre of the disc, and are carried round in the groove to the periphery, where they are discharged through a tangent-spout f^2. The rolling of the shot in this groove (under the pressure of the rotating-disc) has the effect of smoothing down any irregularities left on the surface of the shot when discharged from the die, and of polishing them. The groove should be a little larger at the commencement, where the shot enters, than at the end, and gradually decrease in size from the beginning to the end, that any irregularities on the surface of the ball may be gradually reduced.

Instead of using the grooved plate and disc for rolling the shot or balls, this operation may be effected by means of the last part of the invention, viz.:—The upper journal of a rotating conical block g^2, fig. 9, is so placed as to be in connection with the discharge-hole in the main plate through which the shot are discharged from the swaging part of the machine, so that the shot or balls shall pass down through a hole in the upper journal (shewn in the drawings by dotted lines), and pass into a spiral groove h^2, which runs around

the circular block g^2, from the upper to the lower end, where the shot are discharged. This groove, which presents in its cross section a semi-circle, should be slightly and gradually reduced in size from the top to the bottom, for the reason given in the description of the volute groove. The block is enclosed in a casing i^2, the inside of which is of a form to correspond with the periphery of the block, except that its surface is smooth and covered with leather. To insure the proper position of the case it is permanently fixed on a frame, and provided at top and bottom with journals to receive the shaft of the block g^2. By this means the block and case are always concentric; and, for the purpose of regulating the distance between the inner periphery of the case and the bottom of the spiral groove, the lower end of the shaft, which carries the block, rests on the point of a set-screw k^2, or in a step, regulated by a set-screw or its equivalent. In this way the two can be regulated with the utmost nicety. The form of the block, and the section of the case, is preferred to be a slight deviation from a regular cone, as shewn in the drawings. The block is to be driven in the same manner as the rotating disc, or in any other desired way.

It will be obvious to any one skilled in mechanics, that the required movements may be given to the various parts of the machinery by any of the mechanical devices equivalent to those above described; and that instead of covering the face of the disc, or the inner periphery of the conical case, with leather, the metal face, or any other substance, may be employed, without changing the principle of this part of the invention; but having used leather successfully, the inventor prefers the use of that substance.

The patentee claims the forming of shot or other balls from lead in the solid state, by cutting the pieces, to form the shot, from a bar made thinner and wider than the diameter of the shot or balls required to be produced, substantially as described, whereby he is enabled to make shot or balls, by cutting and swaging without leaving scraps. Secondly,—he claims the punch, made with a semi-spherical cavity in the end, and a cutting edge around, when combined with a die, formed with a cylindrical cavity to receive the punch, and a semi-spherical bottom, provided with a follower as described, for the purpose of swaging shot or balls, and giving them the requisite form when cut from a bar of less thickness than the diameter to be produced. Thirdly,—he claims (in combination with the die and punch) making a hole for the discharge of any surplus lead, as described,—and this, whether the

hole be made in the die or in the punch. Fourthly,—he claims the method of rolling shot or balls by the combined operation of the rotating disc and grooved plate, as described; and this he also claims in combination with the punch and die that form the shot or balls, that the two operations may follow one another to form and finish them, as described. Lastly,—he claims the rotating block, with a spiral groove formed on its periphery, in combination with the surrounding case, substantially as described, for the purpose of rolling and finishing the surface of balls.—[*Inrolled July*, 1848.]

To BENJAMIN LATHROP, *of No.* 7, *King-street, Cheapside, in the city of London, Esq., for an improved wheel for railway purposes,—being partly a communication.*—[Sealed 6th June, 1848.]

THE patentee commences his specification by stating, that hitherto it has been the practice in making cast-iron wheels to have a division or divisions across the nave, to allow of the whole mass contracting with as little strain as possible;—malleable iron hoops being subsequently fastened on the nave, to keep the parts together. Now this invention consists in casting an iron wheel in one piece, of such shape as shall cause the iron to remain without strain when cold.

In Plate II., fig. 1, is an elevation of a railway wheel, made according to this invention; fig. 2, is a section on the line A, B, of fig. 1; fig. 3, is a section on the line C, D, of figs. 1, and 2; and fig. 4, is a section on the line E, F, of those figures. *a*, is the nave, which is cast with a space or chamber *b*, therein; and, supposing the wheel to be three feet in diameter, the nave is eight inches in diameter, eight inches long, and one inch and a half thick. The tire *c*, which is of the usual form, is from one inch and a half to two inches thick, and may be made with or without a flange, as required. The nave and tire, instead of being connected together by spokes, are united by a part which the patentee terms the disc: this disc *d*, is about half an inch thick, and is "corrugated on the plane of the wheel's motion, and at the same time in the line of the radii on a plane at right angles to that plane."

Fig. 5, exhibits a section of a wheel, constructed in the same manner as that just described, with the addition of a set of curved or bent projections *e*, extending from the tire towards the nave.

Fig. 6, is an elevation of a wheel, exhibiting a third form of disc, corrugated radially, and in the plane of the wheel's motion, with the addition of the curved projections *f*, which extend from the nave to the tire. Fig. 7, is a section on the line G, H, of fig. 6; fig. 8, is a section on the line I, J, of fig. 7; and fig. 9, is a section on the line K, L, of that figure. Fig. 10, is a section of a modification of this wheel, corrugated in concentric circles, in the plane of the wheel's motion, but not radially; and figs. 11, and 12, are sections, taken respectively on the lines M, N, and O, P, of fig. 10. Another modification of this wheel is also shewn in the drawings attached to the specification, which differs from that represented at figs. 6, 7, 8, and 9, chiefly in the radial corrugations of the disc being made with a sharper degree of curvature.

The above wheel or wheels may be made with a malleable iron tire, which may be fastened on to a suitable rim, or the outer edge of the disc may be slightly hollowed out and the tire shrunk on to it,—the inside of the tire being convex. The patentee recommends that the "tread" of the wheel should be chilled.

In conclusion, the patentee says, "I do not claim, as my invention, wheels of cast-iron, in which the disc is corrugated in concentric circles only; but I claim, as my invention, Firstly,—wheels of cast-iron of such a form that the part equivalent to the spokes of a common wheel, and which I call the disc, shall be corrugated on the plane of the wheel's motion, and at the same time in the line of the radii on a plane at right angles to that plane. Secondly,—I claim the combination of the corrugated disc, mentioned in claim first, with projections, above described as the second form of disc. Thirdly,—I claim the combination of a disc, corrugated on radii, and in the plane of the wheel's motion, with projections, described as the third form of disc."—[*Inrolled December*, 1848.]

To WILLIAM BRINDLEY, *formerly of Birmingham, but now of Twickenham, in the county of Middlesex, manufacturer, for improvements in the manufacture of articles of papier-maché.*—[Sealed 6th June, 1848.]

IN order to the ready understanding of his invention, the patentee commences his specification by stating that articles of papier-maché have of late years been made by taking a thick sheet of pulp—produced either by placing a succession of sheets of wet paper on each other, upon a sieve or mould,

as they are made; or by obtaining a thickness of pulp upon a sieve or mould, as practised when making millboard—and placing the same, whilst still containing some moisture, between two moulds; and then drying the sheet of pulp whilst it is securely retained between the moulds.

The moulds used in the above operation have been plain; and the present invention consists in employing moulds with sunken or hollow parts, so as to obtain articles of papier-maché from sheets (made as above explained), with designs in relief. The patentee prefers to use metal moulds with engraved or sunken surfaces; but as it would be expensive to make a number of metal moulds of the same pattern, he employs papier-maché for making numerous patterns from one pattern; and this he effects by placing a succession of sheets between the moulds, and then dressing up such moulded articles as if they were to be japanned; but, in place of japanning the same, he only saturates with oil and stoves them; and then he uses them to obtain a series of moulds for making trays and other articles of papier-maché: such moulds will admit of the sheets of pulp being dried and stoved between them. Or, instead of making papier-maché moulds from sheets, in the manner above described, he takes papier-maché articles, moulded and dried between the ordinary moulds, and cuts out, with a sharp knife or instrument, the parts where surfaces in relief are to be obtained on the articles of papier-maché made thereby. The patentee says he is aware that papier-maché goods, which have been produced by grinding matters to a plastic state, have been moulded with raised and ornamental surfaces; he does not therefore claim the moulding of articles of papier-maché generally, so as to obtain surfaces in relief thereon, but only when working with sheets made of pulp by suitable sieves. The articles made according to this part of the invention are to be dressed, saturated with oil, stoved, and finished, in the ordinary manner.

The second part of this invention consists in making basins of papier-maché, which may be used to contain water, by causing sheets of pulp (made by sieves, as above explained) to be pressed between two moulds. The moulds used by the patentee are made of sheet metal. The sheet of pulp is placed on the outside of one mould and caused to take the shape thereof; then the other mould is put on, and the sheets pressed between the two moulds; but, before drying or stoving the same between the two moulds, the patentee examines the inner and outer surfaces of the sheet, to ascertain if they are equal and smooth (and if not so, he repairs the same); he then puts

together the two parts of the mould, which, after finally pressing the pulp, he clamps or fastens securely; and when this has been done he dries or stoves the pulp. After the basin of papier-maché has been dried, the patentee trims and dresses it, saturates with oil, and stoves it, as if it were to be japanned; but, in place of japanning in the ordinary manner, he prefers to paint (with white or other paint) the interior of the basin; and then he subjects it to a heat of about 200° Fahr., or upwards, until the smell of the paint is removed.

The third part of the invention consists in the application of the process for making basins, described under the second improvement, to the manufacture of hats. For this purpose, similar moulds to those used for basins, but shaped suitably for producing the desired hat, are employed;—such moulds having projecting edges to form the rims. The hats are to be produced from sheets of pulp, prepared as before explained; and the same are to be shaped, pressed, dried, trimmed, saturated with oil, and stoved, as above described: the hats may be finished by japanning, painting, or otherwise.

The patentee does not confine himself to the details so long as the peculiar character of his improvements is retained; but he claims the means of manufacturing articles of papier-maché above described.—[*Inrolled December,* 1848.]

To WILLIAM SEATON, *of Camden-town, in the county of Middlesex, Gent., for improvements in closing tubes, and in preventing and removing the incrustation in boilers.*—[Sealed 30th May, 1848.]

THE first part of this invention consists in a mode of closing the ends of the tubular flues of steam-boilers, by making the said ends round and hemispherical. This part of the invention is applicable to that class of steam-boilers in which numerous short tubes are fixed to the bottom, and descend into the space over the fire and into the main flue, by which the same is divided into numerous passages or flues;—the lower ends of the tubes being closed. The mode of closing the ends of the tubes, heretofore adopted, has been by stamping out pieces of metal of the same kind, thickness, and internal diameter as the tube to be closed, and then soldering the same, if of copper or alloys of metal, or welding them, if composed of iron. The patentee closes the end of the tube by means of the instruments represented in Plate III., at fig. 1, consisting of a die *a*, and an iron or steel mandril *b*,

(shewn separately at fig. 2,) the upper end of which is rounded or made hemispherical; and it is made of such length that the tube *c*, when placed upon it, shall project sufficiently above the mandril to be closed upon it when compressed by the die. The die *a*, is fixed in a screw or other suitable press, and the mandril *b*, with the tube upon it, is placed perpendicularly beneath the die, which is then caused to descend and compress the end of the tube into a hemispherical shape, as shewn at fig. 3. If the tube be of iron, the end is to be heated to a welding heat before it is put upon the mandril. If the tube be made of copper or an alloy of metal, the end cannot be perfectly closed by the action of the die; and therefore a small hole is left or made in the end of the tube, into which a small rivet (of the same metal as the tube) is inserted, and is compressed upon the mandril by the descent of the die.

The second part of this invention consists in improvements in preventing and removing incrustations in steam-boilers and steam-generators; which incrustations are produced by the lime contained in the water that is converted into steam.

The first mode of preventing incrustations, described by the patentee, consists in connecting the boiler with a tank, into which the water is first introduced, and is there acted on by a chemical agent, so as to precipitate the lime; but if time cannot be allowed for precipitation, it will be desirable also to filter the water through charcoal and sand before it enters the boiler. The patentee prefers to employ oxalic acid, carbonate of potash, or carbonate of soda, for precipitating the lime, although other chemical agents may be used; and he adds the same to the water until the precipitation of the lime ceases.

Or, instead of causing the lime to be deposited before the water enters the boiler, the incrustation of the boiler is prevented by the use of an acid, or the matter hereafter mentioned, which is capable of retaining the lime in solution, so that it may be discharged from the boiler through the blow-off cock, in the same way as mud or sand. The patentee prefers to use muriatic, nitric, or acetic acid for this purpose; but he does not confine himself thereto. The quantity of acid required will depend upon the quantity of lime held in solution by the water, which may be ascertained by analysis. The mode adopted by the patentee for determining the amount of lime contained by the water, is as follows:—He takes a quart or other measure of the water to be tested, and puts into it one, two, or more grains of oxalic acid, which

causes the lime to be precipitated to the bottom of the vessel; when this has subsided, he adds a further quantity of acid, until no further precipitation of lime takes place; and then he takes the lime out of the water and weighs it. A quantity of muriatic acid, equal in weight to the amount of lime contained by the water, is to be run into the boiler with the water, and the lime will thereby be kept in solution. In cases where the boiler is already incrusted, the patentee uses the acid slightly in excess of what is required for the water, in order to remove the incrustation.

When salt water is to be treated, the patentee uses salsola or saltwort, instead of acid;—the quantity required being equal in weight to the lime contained by the water.

Another mode of preventing incrustation consists in the introduction of wood in a finely-divided state, such as saw-dust or powdered charcoal, into a boiler containing water having lime therein: this material absorbs and takes up any surplus particles of the lime held in solution; and it also acts by friction upon the plates of the boiler. The amount of wood or charcoal used should be equal to double the weight of the lime known to be in the water; and a fresh supply should be introduced about once a week;—that which has been previously used being first blown out.

The patentee claims, as his invention, Firstly,—the closing of the ends of tubular flues by dies. Secondly,—the means of preventing and removing incrustations in steam-boilers and steam-generators, above described.—[*Inrolled November,* 1848.]

To William Taylor, *of Birmingham, in the county of Warwick, mechanist, for an improved mode of turning up or bending flat plates of malleable metals or mixtures of metals, by aid of machinery, into the form of tubes.*—[Sealed 18th May, 1848.]

This invention consists in an improved mode of manufacturing tubes by means of machinery, in which a flat plate of metal is laid upon a moveable bed, over a long groove therein, and is carried by the bed beneath a series of rollers; some of which rollers press the plate downwards into the groove, so as to cause it to assume the form of a gutter; and then, by the action of the remaining rollers, the two sides are turned inwards, one towards the other, and downwards upon a mandril, until the edges meet or overlap, and form either a butt-jointed or lap-jointed tube.

In Plate II., fig. 1, is a plan view of the machine for making tubes according to this invention; and fig. 2, is a longitudinal vertical section, taken through the middle of the machine. A, is the fixed framework of the machine, which is similar to the fixed bed of a slide-lathe or planing-machine; and in this framework a carriage B, slides;—motion being communicated thereto by the pinion D, on the shaft E, gearing into a rack formed on the under side of the carriage. The upper side of the carriage B, is formed with a straight parallel groove, and in it is fixed the bed C, which is formed with a straight semi-cylindrical groove along the middle of its upper side, corresponding exactly in size with the half of the required tube. F, is a convex roller, the axis of which is mounted in bearings carried by the framework A; on one end of the axis is fixed a spur-wheel G, which gears into and is driven by another spur-wheel H, upon the shaft I; and the axis of the roller F, is made of a conical form, so that when the edges of the metal plate J, are caused to turn upwards (by the roller F, pressing the middle portion of the plate into the semicylindrical groove of the bed C,) it will prevent either edge from turning up further than the other edge. K, is a second convex roller, which serves to bend the middle portion of the plate J, further downwards, so that it will touch the bottom of the semi-cylindrical groove in the bed C; the axis of the roller K, is mounted in suitable bearings, and on one end of it is fixed a spur-wheel L, which gears into a pinion M, on the end of the shaft E. N, N, are two conical rollers, the axes of which are mounted in inclined positions in the frame O; the edge of each roller is concave, so that together with the groove in the bed they form a complete circular aperture; and they will therefore press the edges of the plate J, together and form it into a tube upon the mandril P. Q, is a concave roller, which finishes the tube; upon its axis a spur-wheel R, is fixed, and gears into a pinion S, upon the shaft T; and this shaft also carries a pinion U, similar to the pinion D, and gearing into the teeth of the rack on the under-side of the carriage B.

In fig. 1, the centres of the two conical rollers N, N, are represented exactly in a line across the length of the bed C, at right angles thereto, which would be suitable for making a butt-jointed tube; but when the edges of the plate are to overlap (to form a lap-jointed tube), the centre of that roller N, which is to operate on that edge of the plate which is to be innermost, should be situated somewhat in advance of the centre of the other roller, as represented in the plan view,

invention, into the form of tubes, may afterwards be finished by any of the modes usually practised in making tubes of metal plate, such as welding, brazing, or soldering.

The patentee, in concluding his specification, says, that the invention whereof the exclusive use is granted to him consists in "the improved mode, hereinbefore described, of turning up or bending flat plates of malleable metals or mixtures of metals into the form of tubes, by aid of machinery of the kind hereinbefore described. And although most of the several parts of that machinery have been heretofore used in other machinery, the combination of those parts, one with another, for the purpose aforesaid, and the manner whereby the turning up or bending is performed by such combination, constitute my new invention. The peculiarity and novelty of the said combination of parts, and of their said manner of turning up or bending, being, that the flat plate is laid upon a bed, over a long groove therein; which bed, together with the plate, is moved endway forwards beneath a series of rollers; by action of some of which rollers (either direct action or by the intervention of a mandril) the middle part of the plate is bended down into such groove, first to a part of the depth thereof, so as to bend the plate to a shallow gutter form, and next to the bottom thereof, so as to bend the plate to a deep gutter form; the two sides of which deep gutter form are (by action of other of the said rollers) afterwards turned inwards, one towards the other, and downwards upon a mandril, either stationary or moveable with the plate;—the two sides of the said deep gutter, which are so turned down, either meeting edge to edge, or with the edges overlapping, as may be required.—[*Inrolled November,* 1848.]

To ANTHONY LORIMIER, *of Bells-buildings, Salisbury-square, in the City of London, bookbinder, for improvements in combining gutta-percha and caoutchouc with other materials.*—[Sealed 10th July, 1848.]

THE first part of this invention consists in cutting gutta-percha into very thin shavings (which the patentee prefers to effect by the aid of the machinery hereafter described, but any other suitable means of cutting the gutta-percha may be employed); then drying the same by spreading them over any suitable surface; and afterwards subjecting the shavings of gutta-percha to the action of other machinery, by which they are bent in various directions and reduced or divided

into smaller pieces: by this means the impurities will be separated without the use of heat or water, and the gutta-percha rendered suitable for use at a very small cost.

In Plate III., fig. 1, exhibits an apparatus for cutting the gutta-percha into thin shavings. *a, a,* are bent blades of steel, securely attached to two discs *b, b,* which are fixed upon the shaft *c,* so as to form a helical cutter; the shaft *c,* turns in bearings carried by the frame *d,* and is caused to rotate by any convenient means; the block of gutta-percha *e,* is placed in the trough *f,* beneath the adjustable pieces or guides *g, g,* and is gradually moved up to the rotating cutter by means of the screw *h*: when nearly the whole of the block of gutta-percha has been cut into thin shavings, the piece remaining is cemented to one end of the next block that is to be subjected to the action of the cutter. Fig. 2, shews an instrument which may be substituted for the cutter represented at fig. 1; it consists of a series of small cutters *i, i,* fixed helically round a cylinder *j.* Fig. 3, represents another cutting instrument, consisting of a plate *k,* affixed to the end of a shaft, at right angles thereto, and formed with recesses to receive a series of cutters *l, l,* which are secured therein by strips or pieces of metal *m*: the cutters *l,* are shaped like a hook in their transverse section;—the point of the hook being the cutting edge. Another cutting instrument, similar to that shewn at fig. 3, is delineated in the sheet of drawings attached to the specification; but in this case the cutters are fixed tangentially instead of radially. Fig. 4, represents another form of cutter, which is fixed upon the end of a shaft, and the block of gutta-percha, to be cut into thin shavings, is placed parallel to the shaft.

After the shavings of gutta-percha have been dried, they are subjected to the action of the machine exhibited in vertical section at fig. 5. It consists of a cylinder *n,* in the interior of which three double rows of spikes *o,* are fixed, at equal distances apart; at the lower part of the cylinder there is a grating or sieve *p,* and at the upper part there is a hopper *q*; and the cylinder *n,* contains another cylinder *r,* which is furnished with four double rows of spikes *s.* The cylinder *r,* is caused to rotate, and the shavings of gutta-percha being introduced through the hopper, are subjected to the action of the spikes, which cause the dirt and impurities to be disengaged, and to fall through the grating *p.* When the gutta-percha is sufficiently cleansed, it is taken out of the cylinder *n,* by opening the grating (which is hinged), and introduced into another machine, shewn in plan view at

fig. 6. This machine consists of a vessel *t*, enclosed in a steam-case; in the interior of the vessel three rows of pointed bars *u, u*, are fixed, at equal distances apart; and in the centre of the vessel there is an upright shaft *v*, with four rows of pointed bars *w*, projecting therefrom, which, when the shaft is rotating, pull the gutta-percha into strings: by this means all the spongy parts containing air or moisture will be broken open; and it is during this operation that the various dry materials which the patentee desires to combine with the gutta-percha are added. Fig. 7, is a vertical section of what the patentee terms a "welding machine," consisting of a vessel *x*, enclosed in a steam-case *y*, and containing two rollers *z, z*, the surfaces of which are formed with alternate projections and indentations; and these rollers, whilst revolving, keep squeezing and stretching the gutta-percha, so as to cause the most intimate closing and union of all the parts, and thereby increase the strength and elasticity thereof.

The patentee states that he does not confine himself to the use of the above machinery for carrying out the first part of his invention, which consists in cutting the crude gutta percha into shavings, and, when dry, causing them to be so beaten and bent about and reduced as to remove the impurities or foreign matters.

The second part of the invention consists in combining gutta-percha with burned clay, burned flints, broken articles of earthenware and china, marble, Portland, Cornish, and other stones, crushed and sifted, likewise oxide of zinc, oxide of copper, hydrate of lime, oxalate of lime, and also a compound of lime slaked with oxalic acid dissolved in water: in preparing this compound about three pounds of acid are used to each bushel of lime; the acid is first dissolved in a sufficient quantity of water for slaking that quantity of lime; and, after the solution has been added to the lime, the product is well dried and sifted. Any one or more of these materials may be combined with gutta-percha, with or without other materials, so as to produce new compounds of gutta-percha, useful for moulding articles or for making sheets, suitable to be cut into soles for boots and shoes, straps, bands, and other articles. The above matters are to be ground very fine and sifted; and the gutta-percha may be combined therewith by any convenient means; but the patentee prefers to lay the gutta-percha on a heated plate and roll it into a sheet, then to sift the materials over the sheet and fold and re-roll the same, and to repeat the folding, rolling, and sifting of the materials until the desired compound is produced; or he rolls the gutta-

percha between two smooth heated rollers, then dusts on the powder and folds the sheets, and again and again rolls the same till the desired mixture is obtained. He further states that in place of using the "welding-machine," before mentioned, he can employ like means to those just described for combining the small pieces or shavings of gutta-percha into a mass. The compounds of gutta-percha may, whilst still in a heated state, be moulded to any desired form or rolled into sheets. When great elasticity is required, caoutchouc is mixed with such compounds of gutta-percha.

The third part of this invention consists in combining oxide of zinc, oxalate of lime, and also the compound produced by slaking lime with oxalic acid and water, with caoutchouc: these matters are used either separately or together, and are combined with the caoutchouc in the same manner as the above materials are stated to be combined with the gutta-percha. The compounds thus produced are useful for spreading over fabrics, to make them waterproof, and for other purposes: to facilitate the spreading, the ordinary solvents of caoutchouc may be used.

The patentee claims, Firstly,—the means of cleansing gutta-percha, preparatory to compounding and using the same. Secondly, the combining gutta-percha with the matters above described. Thirdly, the combining caoutchouc with the matters above described.—[*Inrolled January*, 1849.]

To William James Barsham, *of Stratford, in the county of Essex, manufacturer, for improvements in the manufacture of mats.*—[Sealed 1st June, 1848.]

This invention consists in a novel manufacture of mats, the peculiarity being that they are composed of alternate rows of upright fibres and of laths, which latter securely retain the different rows of fibres in their proper positions.

In Plate III., fig. 1, is a plan view of a mat constructed, according to this invention, of laths *a*, and fibres *b*; fig. 2, is a longitudinal section, and fig. 3, is a transverse section of the same. The operation of making a mat is commenced by winding the fibres around the laths in the manner shewn at fig. 4, which represents a lath having a cord of cocoa-nut fibre (coir) wound round it; but other fibre may be used,—the object being to obtain a series of rows of fibres on end between laths, in such a manner that on the laths being compressed and fixed together a mat will be formed; and this

the patentee says he believes will be best accomplished by winding a cord of fibres round laths, and, after combining a series of laths, cutting the cords of fibres, as hereafter explained. When a suitable number of laths have been prepared, by winding fibres around the same, they are placed in a compressing-machine; and to the two outside laths a lath a^1, is nailed, to form, as it were, a selvage to the mat. The compressing-machine consists of a strong framework, on which the laths are laid in a horizontal position, side by side; and a hinged frame, to prevent them from rising while being pressed together, is placed over them. The laths are pressed together by means of a bar, which extends across the machine beneath the hinged frame, and is furnished with two nuts; these nuts receive two screws, which pass horizontally through part of the framing, and upon their outer ends two cog-wheels are fixed; these cog-wheels gear into a third cog-wheel, which, being turned by means of a handle, will cause the screws to rotate and, by pushing the bar forward, press the laths closely together. The fibres, for a few inches at the outer ends of the laths, are then to be cut; and the metal binding *c*, (shewn detached, in an extended state, at fig. 5,) is to be fixed upon the ends of the laths, so as to fasten them securely together. The nearly-completed mat is now to be removed from the compressing-machine, and finished by cutting the fibres along the centre of each lath: the mat will present the appearance represented at fig. 1. The patentee states that the best instrument for cutting the fibres is that shewn, in side view and end view, at figs. 6.—*d*, is the cutting edge, and *e*, a piece which slides upon the lath as the cut is made. When the fibres are worn out, the laths may be re-covered with fresh fibres.

The patentee claims, as his invention, the mode of manufacturing mats above described.—[*Inrolled December*, 1848.]

To William Swaine, *of Pembridge, in the county of Hereford, brick-maker, for certain improvements in kilns for burning bricks, tiles, and other earthen substances.*—[Sealed 18th July, 1848.]

This invention consists in an improved construction of kiln, whereby the fuel to be consumed therein may be employed with greater advantage.

A transverse section of an improved kiln is represented in Plate III. *a*, is the body of the kiln; *b*, *b*, are the feeding-

places or pipes, which are kept closed, except when the fuel is being introduced into the fire-places; *c, c,* are the furnace doors, which are each formed with an opening for the introduction of a rake, in order to rake the fire without opening the doors, and the opening is closed at other times by a small door *d*; *e, e,* are air pipes, leading to the fireplaces; *f, f,* are the ash-pit doors; *g, g,* are fire-boxes, built of fire-bricks, with holes between the bricks, similar to those heretofore used in some kilns—but, if preferred, other arrangements may be made for receiving the fuel; *h, h,* are brick ledges, for throwing off the coals as they come through the feeding-pipes; and *i, i,* are the chimneys or outlets at the top of the kiln, of which there are nine. The doors *c, d,* and those which cover the passages *b, e,* and *f,* move on an axis at one side, and at the other side are supported by a pin or stop; but it is not essential that this form of door should be used, so long as the openings are closed by doors which fit closely, in order that the passage of air into the fire-places and kiln may be partially or entirely stopped: by this means the person attending the fires may with great nicety regulate the condition of the fires, and, when necessary, may prevent combustion, by stopping the supply of air.

The patentee does not confine himself to the above details so long as the peculiar character of his invention be retained, whereby he prevents a greater influx of air to the interior of the kiln than is required for the combustion of the fuel; by which means a considerable economy in the consumption of fuel is effected.—[*Inrolled, January,* 1849.]

To Chevalier Alexandre Edouard Le Molt, *of Conduit-street, Regent-street, in the county of Middlesex, for certain improvements in apparatus for lighting by electricity; parts of which may be made use of in other applications of electricity.*—[Sealed 20th July, 1848.]

The first part of this invention relates to certain improvements in the manufacture of piles or batteries for evolving electric currents, to be applied to the production of light and other uses.

One of such improvements consists in the application of the carbon which is found in the retorts used in the manufacture of coal-gas as one of the elements of an electric pile. The carbon, as it comes from the retorts, simply requires to be cut to the desired shape: the patentee prefers to use it in

rectangular plates or blocks; but it may be cut into other forms. At fig. 1, in Plate III., *a*, is a plate or block of carbon, connected with a cylinder of amalgamated zinc *b*, by means of a strip of metal *c*, which is soldered or rivetted at one end to the cylinder *b*, and at the other end is soldered to the upper extremity of the carbon: the upper end of the carbon is coated with copper or other metal, for this purpose, by the electrotype process; and this constitutes another of the improvements. A further improvement consists in coating the cylinder of amalgamated zinc on one side (the outer side in the present arrangement) with a varnish or other suitable matter, which will prevent the liquid used from acting on the zinc on the protected side: such side having no relative influence whatever with the carbon element would otherwise be uselessly exposed to the destructive action of the acid. The patentee prefers to use copal varnish as the protecting material; and he gives a body to the same, by grinding finely-powdered retort carbon therewith. The connecting strip of metal, and the electrotyped end of the carbon element, are also to be coated with the varnish. A battery, constructed according to this invention, is shewn at fig. 2, where *d, d,* are two stoneware jars, each containing a porous jar *e*, which receives the carbon element *a*, of the pile, and is surrounded by the cylinder of amalgamated zinc *b*; into the jars *e*, nitric acid is introduced; and in the jars *d*, a solution of sulphuric acid, composed of one part of acid to seven parts of water, is used. When the apparatus is intended to be carried about, the patentee prefers to make the jars *d*, with a flange or rim* at the top, as shewn at figs. 3, and 4, to prevent the liquid from splashing.

Another improvement, described under this head of the invention, consists in making carbon elements for electric piles by causing the carbon to be moulded and then subjected to great pressure, by means of hydraulic or other suitable presses, in order to obtain the carbon as dense and compact as possible. The patentee prefers to use one part of powdered coal, coke, or charcoal, three parts of carbon from gas-retorts, and one part of tar; these materials are to be well mixed, moulded, and subjected to pressure; then dried, by exposure to the action of the atmosphere, in the shade, for a few days; and, when dry, the mixture is to be subjected to heat in a nearly-closed retort for thirty-six hours,—the heat being applied gradually till it arrives at a bright red heat, and then to be allowed to cool down gradually: the carbon is then ready for use.

The second part of this invention relates to the apparatus for producing light by electricity; and it consists in using discs of carbon as electrodes, in such manner that, by revolving near each other in the same plane or in planes at an angle to each other, they shall constantly present fresh surfaces, and, when they have made a revolution, they shall be caused to approach each other, so as to maintain a constant and proper relation to each other for the production of a continuous light.

Fig. 5, is an elevation of the apparatus employed in carrying out this part of the invention. *a, a,* are two electrodes of gas-retort carbon, which are first cut into the form of discs, and then purified by immersion in a solution of nitric and muriatic acid for 12 hours and afterwards in a solution of fluoric acid for 12 hours. A slow uniform motion may be communicated to the discs by any suitable mechanism; but the patentee prefers to employ that shown at fig. 5, wherein the motion is derived from suitable clockwork, the axis *b*, of which only is shewn. The two discs turn on pivots or axes at the upper ends of the arms *c, c*; these arms are mounted, at their lower ends, upon an axis *d*, so as to move freely thereon; and the upper ends of the arms are continually drawn towards each other by a spring *e*, but are prevented from approaching too closely by the pieces *f, f*, which bear against the periphery of the excentric or step-wheel *g*. The two discs are caused to rotate by means of two endless chains or bands, passing around the pulleys *h, h*, on the axes of the discs, and around a pulley *i*, fixed to a toothed wheel *k*, which gears into another toothed wheel *j*, on the axis *b*. Rotary motion is also given to the excentric or step-wheel *g*, by means of the train of wheels *j, k, l, m, n*; so that, when the discs have made a complete revolution, the wheel *g*, may present a deeper step or depression to each of the pieces *f, f*, and thus permit the arms *c, c*, to approach nearer to each other, in order to compensate for the wear of the two electrodes. *o, p*, are the wires connected with the battery. The part marked with a * is made of some non-conducting material; and the other parts are made of metal. It is not essential that the two electrodes should rotate in the same plane, as they may rotate in planes at right angles to each other, as shown at fig. 6. The patentee states that he does not confine himself to the use of two discs, as a single disc may be employed with another form of electrode.

The patentee claims, Firstly,—the application of that description or quality of carbon obtained by the destructive

distillation of coal and other matters, such as are used in the manufacture of gas, as one of the elements of an electric pile; also the employment of carbon moulded and subjected to pressure and manufactured as above described; also the electrotyping the ends of carbon used as elements in electric piles; also the connecting of carbon elements of an electric pile with other elements used, by soldering or by other permanent fixture. Secondly, the so applying two discs of carbon as electrodes that they shall (when they have completed a revolution) be caused by the mechanism to approach to each other, and thus obtain a continuous light by electricity.—[*Inrolled January,* 1849.]

To George Walter Pratt, *of the city of New York, in the United States of America, Gent., for improvements in the manufacture of printing ink,—being a communication.*—[Sealed 29th July, 1848.]

This invention consists in the employment of rosin oil in the manufacture of printing ink.

The patentee uses the rosin oil in the preparation of a varnish or composition, which he combines with pigments or coloring matters to make the colored printing inks desired to be produced. In making printing inks it has being usual to employ linseed oil and, in some instances, other oils, combined with rosin, soap, and coloring matters; but the use of linseed oil renders the preparation of printing ink an expensive process; and the object of this invention is to lessen the cost, by substituting rosin oil for linseed and other oils.

In making printing ink, according to this invention, the patentee takes one pound of rosin oil, thirteen ounces of rosin, and three ounces of yellow soap; and, by the application of heat and continued stirring, he thoroughly blends the same: he increases the proportion of rosin and soap when the ink is required to be more stiff, and decreases it when the ink is required to be more fluid. This varnish or composition, when cold or nearly so, is to be ground with pigments or coloring matters, in the same manner as when the varnish is prepared with linseed oil.

The patentee does not confine himself to the above details, so long as rosin oil is used in the manufacture of printing ink. He claims the mode of manufacturing printing ink above described, whereby rosin oil is combined with materials suitable for printing ink.—[*Inrolled January,* 1849.]

To Joham Arnold Steinkamp, *of Leicester-street, Leicester-square, in the county of Middlesex, Gent., for improvements in the manufacture of sugar from the cane, and in refining raw sugar.*—[Sealed 18th July, 1848.]

This invention consists in clarifying and purifying the juice of the sugar-cane, as well as raw sugar, by the use of raw cotton or other vegetable fibres, cut or divided into pieces varying from one-eighth to one-fourth of an inch in length.

The external gloss on the raw cotton is destroyed by pouring hot water upon it, turning it about so as to wet it thoroughly, and allowing it to remain in the water for about twelve hours: it is then ready for use. The apparatus or filter, in which the cotton is to be used, consists of a vessel, rather wider at the top than at the bottom, having a cock near the bottom to draw off the liquid; and above this there is a wooden frame, crossed by thin strips of wood, over which a coarse cloth is stretched. To clarify one hundred pounds of raw sugar, from two pounds to two pounds and a half of raw cotton are required; which, after being prepared with hot water, as above mentioned, will, when taken from the water and pressed by hand, weigh about six or seven pounds. The cotton being placed in the filter, a sufficient quantity of water is poured in to cause the cotton to be distributed smoothly and equally in the same; and then, on the water being drawn off by the cock, the cotton will fall into its proper position. Upon the cotton a coarse cloth is laid; and on this is placed a frame, crossed by thin strips of wood, which is to be so formed that it may be pressed down upon the cotton when required.

In refining raw sugar, the patentee adds, to every thousand pounds thereof, from five hundred to six hundred pounds of water, from one to two pounds of pulverized chalk, and half a pound of starch: he states that the starch is not absolutely necessary, but appears to have a beneficial effect. The liquid is then brought to a boiling heat, and kept boiling from eight to ten minutes; during which time it is well stirred, and the scum or froth skimmed off; and then the liquid is allowed to pass through a sieve into the filter. The act of pouring in the liquid or syrup will cause the water to be forced out of the prepared cotton, and to run off through the cock; and this water is to be preserved, in order that it may be poured upon the cotton at the termination of the filtration. If the syrup should run off too quickly, the cotton is to be lightly pressed down. When the syrup has passed through the

filter, it may be boiled down to the point of crystallization. As the materials used in this process of cleansing or refining raw sugar are perfectly neutral with respect to it, less uncrystallizable sugar is produced; and as sugar so treated has a very strong tendency to crystallize, great attention must be paid to the boiling and claying processes. By pouring water into the filter it may be perfectly freed from the sugar, while the impurities will remain in the cotton; and the impurities may be removed by taking the cotton out of the filter and washing it with water. The cotton may be mixed and even boiled with the sugar, and afterwards poured into the filter, and the syrup made to pass through the cotton; instead of the cotton being first put into the filter and the syrup poured on to it.

For cleansing the cane-juice in the colonies, the patentee employs the same means as those above described for clarifying raw sugar: either cleansing the juice by means of caustic lime, and afterwards filtering the same through the cotton; or else mixing the chalk with the juice, boiling the same quickly, keeping it at the boiling point for some time (skimming off the impurities as they rise to the surface), and then filtering it through the cotton;—by this latter process the fermentation and decomposition of the sugar will be nearly, if not altogether, prevented, as no fermentation can take place at the boiling point, and the acids which are in the sugar will be neutralized by the chalk.

Other vegetable fibres may be substituted for cotton, or used in combination therewith.

The patentee claims, as his invention, the use of cotton or other vegetable fibre, cut or divided into small lengths—preferring cotton to other vegetable material—in the cleansing, purification, and refining of sugar-cane juice, and refining of raw sugar, as above described.—[*Inrolled January,* 1849.]

To LEON CASTELAIN, *of Myddleton-street, Clerkenwell, in the county of Middlesex, late of Paulton-square, in the same county, chemist, for improvements in the manufacture of soap.*—[Sealed 11th July, 1848.]

THIS invention consists in the application of gum Carragan or Irish moss, or other moss of a like character, together with water and salt, in the manufacture of soap.

With each cwt. of the Irish moss the patentee uses 672 gallons of water, which he first heats to the boiling point in

a suitable vessel, by steam pipes or other convenient means, and then he intoduces the Irish moss and covers the vessel. The contents of the vessel are well stirred for ten minutes; then they are caused to boil slightly for about five minutes; after which the steam is shut off, and the Irish moss allowed to stand or macerate for three hours,—being stirred slightly at intervals of twenty minutes. At the expiration of this time the contents of the vessel are drawn off by a cock at the lower part thereof, and strained through basket-work (which will retain the larger pieces of moss), and subsequently through horse-hair cloth, so as to separate any small pieces of moss that may remain in the liquor. The liquor is run into a vessel containing the requisite quantity of salt to be employed according to this invention (which should be in the proportion of four ounces of salt to each gallon of liquor) and the mixture is stirred briskly until the salt is dissolved: the patentee prefers to use salt made from sea-water, and not that prepared from rock-salt or brine. The mixture, thus prepared, is combined with soap in the proportion of one ton of the former to five tons of the latter. The soap is run into the frames, and then the mixture, which should be at the same temperature as the soap, is stirred in.

The patentee states, that he has not found it advantageous to employ the mixture when making mottled soap and soft soap.

He claims, as his invention, the application of gum Carragan or Irish moss, and other moss of a like character, together with salt and water, in the manufacture of soap.—[*Inrolled January*, 1849.]

To Joseph Clinton Robertson, *of Fleet-street, in the City of London, civil engineer, for improvements in the manufacture of gas for illumination, and of the residual products into articles of commerce,—being a communication.*— [Sealed 6th July, 1848.]

The first part of this invention consists in manufacturing gas from rosin in combination with potash and lime, or soda and lime, or potash, lime, and soda, or any one or two of the said substances in combination with any other alkaline substances, and in conjunction also with saw-dust or other fibrous vegetable matter in a finely divided state. These materials are mixed together (but the patentee does not state in what proportions) and introduced into cast-iron cases, of a cylindrical or other form, adapted to the shape of the retort in which the

distillation of the materials is to be effected;—such cases being permanently closed at one end and provided at the other end with caps, covers, or plugs, which are fitted so loosely as to be easily driven off by a slight internal pressure. The cast-iron cases are placed in a retort, similar to an ordinary gas retort, and arranged at such distances apart as to admit of the caps, covers, or plugs being forced off by the pressure of the gas within. The gaseous products are conducted from the first retort, by a tube, into a second retort, of the same description as the first, filled or nearly so with lumps of coke or lime, broken bricks, or similar materials in a fragmental state, and heated to a cherry redness previous to the introduction of the gaseous products. If only a very pure gas is desired to be obtained, the gas is made to pass from the second retort through a third and even a fourth retort, filled with materials of the same description and in the same incandescent state as those employed in the second retort; but when it is desired to separate and collect the oil or oleaginous matters held in suspension by the gaseous products resulting from the distillation in the first retort, (which operation of separating and collecting the oil constitutes the second part of this invention), the gaseous products are passed through a close tank, nearly filled with water, from which an ascension-pipe leads to an hydraulic main: The water retains the oil or oleaginous matters, or the greater part thereof, while the gas passes into the hydraulic main, thence to a water-washer, next through a dry lime or milk of lime chamber, and is finally delivered into a gas-holder.

The third part of the invention consists in manufacturing an antifriction grease from the oil obtained as above, by mixing it with dry lime or milk of lime, and adding zinc, or one of the alloys of zinc, reduced to a granulated state, in the proportion of five parts, by weight, of zinc or alloy of zinc, to each hundred parts of oil.

The fourth part of this invention consists in obtaining a spirit (which may be used for illumination and as a varnish or vehicle for color) from the above oil, by distillation and rectification. In the first distillation of the oil care is taken not to raise the temperature higher than is just sufficient to give the oil, which is originally of a yellowish color, a brownish or tawny appearance. The spirit which comes over from this first distilliation is rectified by re-distilling it, once, twice, or oftener, in combination with a small quantity of lime, until it attains the required degree of whiteness:—three quarers of an ounce of lime should be used to each pound of spirit.

The patentee claims, Firstly,—the manufacture of gas for illumination from rosin, by mixing it with alkaline and vegetable fibrous substances, and exposing these crude materials to the action of heat, in cases placed in retorts, and passing the resulting volatile or gaseous products through retorts, one, two, or more, filled with lumps of coke or lime, or broken bricks, or other like materials, in a fragmental and incandescent state. Secondly,—the separation and collection of the oil or oleaginous matters contained in the volatile or gaseous products resulting from the first distillation of the said crude materials, by passing the same through water, as above described. Thirdly,—the manufacture from the said oil of an antifriction grease, by the admixture of lime and zinc or some alloy of zinc. Fourthly,—the manufacture from the said oil of a spirit, by the process and means above described. —[*Inrolled January*, 1849,]

To William Edward Hollands, *of Regent's-quadrant, in the county of Middlesex, dentist, and* Nicholas Whitaker Greene, *of Walton-place, Chelsea, in the county of Middlesex, Gent., for a new manufacture of artificial fuel in blocks or lumps.*—[Sealed 4th September, 1848.]

This invention consists in using plaster of Paris and caustic cements with water to combine small coal, with or without other materials, into blocks or lumps, and thus producing a new manufacture of artificial fuel; also in causing artificial fuel, which is liable to become friable or decrepitate when exposed to the atmosphere, to be coated with oil.

The patentee states that the cementing matters which they prefer to use are, gypsum and calcined lime with water, in such quantity that the caustic cementing matter of the lime and the well-known hardening character of the gypsum will, when combined with the water, set and crystallize, and form the small coal into concrete blocks or lumps. Roman cement, or calcined river or sea mud, may be used with water, but not with such advantage as gypsum and caustic lime. The manner in which the patentees form the small coal, with or without other materials, into blocks, is, by mixing the small coal with the gypsum and lime and then applying the water (similar to the mode of making concrete for building purposes); after which the mixture is to be placed in moulds, subjected to pressure, and dried. Although a useful fuel will by this means be produced, yet sometimes it will be desirable to add

other ingredients: thus, to obtain a quickly-lighting fuel, a small quantity of nitrate of soda or potash, or other similar salts containing large quantities of oxygen, such as the chlorate and chromate of potash, should be added; to produce fuel which will burn comparatively slowly, a small quantity of alum should be added to the other ingredients; and to obtain fuel which will burn clear and bright, a small quantity of common or rock salt should be used. The patentees state that a very useful fuel for steam-boiler furnaces (which will not be liable to become broken, when burning) may be made by combining together 140 parts, by weight, of calcined gypsum, ground fine, 17 parts of caustic lime, 17 parts of ground alum, 17 parts of common or rock salt, 28 parts of aluminous clay, and 2240 parts of small coal: the clay may be omitted; but, in such case, the patentees prefer to increase the proportion of the cements above mentioned; and if a quickly-lighting fuel be required, they substitute nitrate of potash or soda for the alum.

Some artificial fuels (particularly such as are composed of small coal combined with clay and other matters which do not possess strong holding or cementing properties) are liable to decrepitate and become friable when exposed for a time to moisture and air; and this the patentees propose to prevent by coating the blocks with oil. They prefer linseed oil; but other oils may be used; and the blocks may be coated therewith either by immersion or by applying the oil with a brush.

In conclusion, the patentees say "we would wish it to be understood that it is the using of gypsum, caustic lime, or the other cements mentioned, with water, to produce concrete blocks or lumps of small coal, with or without other matters, as an artificial fuel, as above described, which constitutes the peculiar character of our invention. And we also claim the coating of artificial fuel with oil, as above described."—[*Inrolled January,* 1849.]

Scientific Notices.

ON PATENT LAW REFORM.

ARTICLE I.

Few persons who have not been personally engaged in bringing about matters for the correction of some social evil, can rightly judge of the difficulties which present themselves to the enthusiast who stands forward to assist in removing a

long-standing acknowledged abuse. With few exceptions it signifies little what may be the matter that calls for correction, or how strongly it appeals to humanity or common sense. Thus the ill-treatment of paupers—intra-mural burials—the holding of cattle-markets in cities—and a host of other equally obnoxious practices, are permitted to exist year after year, despite the efforts of the active opponents to such proceedings. The hindrances to all measures of reform in this country may be said to arise, first, from a general ignorance of the subject in question; secondly, from apathy, or distrust of change, on the part of the public; and thirdly, from the active and organized opposition of parties interested in the retention of the abuse. If questions of home policy—many of which from their extensive bearings might truly be called national questions—fail to arouse the public attention, as in too many cases they do, how else than with neglect should we expect a subject like the patent laws—apparently affecting but a small portion of the community—to be received? This has been the great cause of failure in all attempts at patent law reform. Some fifteen years ago strong efforts were made to enlighten the public as to the state of the patent laws by holding meetings at Birmingham, Manchester, Leeds, and other large manufacturing towns, and although sufficient interest was taken in the movement to induce several members of parliament to pursue the subject in the House of Commons, yet the neglect which their efforts there received shewed them the hopelessness of their task. Since that time we have had Lord Brougham's act for allowing disclaimers and alterations to the specifications and titles of patents—an important concession, certainly, of the legislature, and the tardy fruit, perhaps, of the above-mentioned agitation; but for the last thirteen years patentees have waited, but in vain, for a further instalment of legislative justice.

The systematic neglect which this important branch of the law of property has received will be at once apparent, when we state that, with the exception of the Disclaimer and Amendment Act, and an act for prolonging the term of patents, nothing has been done since the reign of James I. for that class of men who, by developing the powers of mechanism, and discovering the secrets of chemistry, have increased the manufacturing industry of their country, until it has become the admiration of the world. Instead of indicating a desire to foster ingenuity and secure the continued prosperity of the country, our government has practically said, that in the

reign of good king James the subject of protection by letters patent for inventions was settled with such a profound foreknowledge of the requirements of aftertimes, that although society, and every branch of manufactures, has changed, and will ceaselessly change, until improvement has run its limits, yet was there ample provision made for all possible vicissitudes,—to touch the law would therefore be folly, if it were not profanation.

But let us, instead of cherishing the memory of past neglect, look towards the future, and see if there is not something which may give us reason to hope that the justice which the patent law, in an earlier stage of society, was capable of rendering to the inventor (when manufactures were in their infancy) will not be much longer withheld from the inventor of the present day; but that, by an amelioration of the law to suit his present wants, he may have a fair opportunity of reaping benefit from his own exertions.

Now, as far as the *spirit* of the existing laws is concerned, no one can find fault, for justice is the basis on which they rest; but how far they now afford protection to ingenuity is another matter. The mode of administering the laws, as far as regards the *granting* of patents, is, in some respects, optional with the crown, or its representative; for instance, the Attorney-General might, if he thought proper, demand the deposit of a preliminary specification, setting forth the nature of the invention at the time of petitioning for the patent, instead of granting his "report" upon the petition, which recites merely the "title" of the invention. He can also limit the range of the patent; for, instead of allowing it to extend over "all Her Majesty's colonies and plantations abroad," he can confine it to certain localities, as is now the practice when patents for electric telegraphs are granted,—the Canadas being, in every case, excepted. Precedent, although in some degree a guide for the law officers of the crown, does not reign absolute in the department of patent law administration, over which they preside; the consequence of which is, that something like vitality is shewn in the first progress of the patent, while dull and useless formalities (which had a meaning perhaps at one time, or even possessed utility) follow, until the great seal is affixed.

We now again revert to the subject of patent law amendment from the evident move which government is making towards an alteration of some kind in the granting of patents; for the appointing of a commission of inquiry last sessions of

parliament to receive evidence on patent matters; and the general call for returns respecting the fees payable on these royal grants, significantly enough indicate that the axe is sharpening for execution of some kind,—perhaps for lopping off some of the many offices which form the tortuous passages through which patents have to wend their way, until, at their full growth, "our beloved cousin and counsellor" stamps them with the great seal. Whether or not any alterations may yet have been determined on we cannot tell, but we feel we should not be performing our duty to the inventive public by silently awaiting the result of these parliamentary investigations, while we have so much to condemn in the present system, and so much to suggest towards future legislation.

There are two aspects under which an amendment of the patent laws may be regarded; first, as referring simply to an amendment of the existing laws, or secondly, to the adoption of an entirely new code. The latter we should most gladly advocate if we could see any probable chance of carrying such a wholesale alteration; for a patent might then cease to be a royal grant, and become identified, as it really is, in principle, with simple copyrights; whereby many difficulties which now exist would be removed, particularly those relating to the granting of separate patents for the three kingdoms. But if a new code is too sweeping a measure we are by no means so wedded to that suggestion as to reject a judicious alteration of the present laws. There is one point, however, the recognition of which in any future legislation on patents we think it necessary to insist upon,—for without such an acknowledgment the inventor must ever remain in a false position with the public,—and that point is *the indefeasible right of the inventor to the benefits resulting from the exercise of his own ingenuity and skill.* The present tenure upon which the British inventor holds his patent precludes the supposition that he has a right to demand protection for discoveries which are the result of great study and costly experiment—the patent is a royal grant, and therefore a favor conferred upon the recipient, deservedly, it is acknowledged, but not *de jure.*

Let us see what the legal authorities on patent law say on this head. In Mr. Webster's last work, "The Subject-Matter of Letters Patent for Inventions," we have the following:—

"It is also important to remark, that letters patent may be considered in the light of *a reward* for having found out and introduced into public use and exercise something not before known, whereby either a new trade is brought into the realm, or fresh channels for the employment

of capital and industry are opened; and there is this advantage in a reward of this nature, that it is exactly proportioned to the value of the invention to the public; if the invention be useless it is soon lost sight of, and the patentee derives no benefit from it; but if it be of great utility, and come into general use and exercise, the patentee receives a corresponding reward."

And again, Mr. Hindmarch, in the introduction to his elaborate work on patents, says,—

"The mode of *rewarding* inventors which has been adopted in this country, seems to be the best that could be devised:—it is by granting the inventor a monopoly in his invention for a limited time."

The following will make our position still clearer:—

"Accordingly inventors are *never entitled as of right* to letters patent, granting them the sole use of their inventions; but they must obtain them from the Crown by petition, and *as a matter of grace and favor*, and letters patent always express that the grant is so made."

Now as long as the notion prevails that the grant of a monopoly in the proceeds of his own mental labor is a *favor* conferred on the inventor, a feeling of jealousy of such grantee must continue to prevail in the public mind; and the eager desire of gain, which prompts men to the dishonest appropriation of their neighbour's possession, will, when a man is found bold enough to set a patentee's rights at defiance, be glossed over by the fictitious epithet he will acquire of "public-spirited;" and thus the same moral offence which, when enacted on a small scale, subjects the culprit to the discomforts of a jail, will, when an inventor's intellectual property is at stake, be considered not merely as venial, but as deserving the admiration of his neighbours, who, perhaps, benefit with him in the result of his daring. If, however, patent grants were put upon a different footing we should soon have a healthier feeling abroad regarding them, and therefore, in demanding an alteration in the *motif* of such grants, we feel that we are requiring no unreasonable concession; for if the inventor is to be considered in the light of a national benefactor (which title we believe most rational persons will allow him), it is clear that he has done more for his country's welfare than an ordinary citizen, who merely keeps within the bounds of the law, and pursues an orderly course of conduct; he has therefore a *claim* upon the gratitude of his countrymen, and in what less costly way can that be repaid than by allowing to the man who excels his neighbour, a temporary exclusive benefit in that which, by its introduction to public notice, is the cause of his excelling.

The learned judges will tell us, that a patent is a bargain between an inventor and the public, whereby the latter comes

into possession of a secret on condition that a temporary protection is ensured to the inventor for the sole use of the discovery; but how is the general public to understand this, when it is evident that royal favor and the paymemt of enormous fees are requisite to enable him to obtain this protection? The "matter of grace and favor," and the fees can figure in no other light than a portion of the equivalent in the bargain. Our position is no novelty of our own creation; it appears to us as the only reasonable ground upon which the community can be withheld from siezing upon every discovery immediately it is made known; and in this view we are borne out by the American Commissioner of Patents, whose last Annual Report to Congress contains the following remark:—

> "Our whole patent system having its origin in the constitution itself, is built upon the recognition of this absolute right of the inventor to the exclusive enjoyment of the production of his combined genius, labor, and capital. It regards such a description of property as the law does all other descriptions, as sacred and inviolable; in the possession and enjoyment of which the owner has a right to claim protection."

If there were not a positive injury resulting to the patentee from the ground on which he obtains his grant, we should not have raised the point, for we are well aware that this is not a judicious time to bring in question the relative rights of the sovereign and the people; but, as respects the alteration which we suggest, it is nothing more than the enlightenment of the nineteenth century demands. Royal favor, as is well known, was, in an early period of our history, the only fount from which justice flowed; and if resistance to arbitrary exactions sometimes caused the stickler for his rights the loss of a few teeth, this must be looked upon as an exception to the administration of the royal authority. Time, however, which works such mighty changes in the world, has transferred the administration of justice from the changeable will of the monarch to the fixed and defined rules of common law, whereby all kinds of cognizable properties and rights are secured to their rightful owners, with the solitary exception of *inventions*, which can only be protected "as a matter of grace and favor from the crown." In suggesting the propriety of founding the granting of patents on a law of the land, wherein the inventor's indefeasible right is acknowledged, instead of, as at present, on a curtailed assumption of regal power, our desire is to make the *public*, through its representatives, a party to the grant, and thus to remove the feel-

ing which prevails against the sanctity of an inventor's rights. In other words, to put inventions on precisely the same footing as literary copyrights, the terms of protection in the two cases being, for obvious reasons, very different.

A second point which must be considered, whether the existing laws be amended or a new code be substituted therefor, is—*the cost of patents*, which, at its present amount, is a barrier to the exertions of hundreds, if not thousands, of industrious men; and if ingenuity is worthy of encouragement, it is clear what an ill effect this prohibition must have upon the manufactures of the country: in fact, the advocates for keeping up the cost of patents have no other argument than that the country would otherwise be deluged with new inventions. Of late, through the instrumentality of the agricultural societies of the country, subsoil draining has been very extensively adopted by landed proprietors with the view of bringing out the full powers of the land. We would suggest, as a pendant to the argument for prohibiting the development of ingenuity, that an act of parliament should fix a scale for the sectional area of the outlet pipes or drains of every such improved estate; such scale being *below* the adequate area for conducting off the water. By this means the possibility of our corn-markets being deluged with an over supply of home-grown products would be prevented.

To fix a fair sum for the cost of patents is a matter of some difficulty, but we are disposed to think that it is impolitic to to obtain from such a source a revenue which shall exceed the expenses necessary for carrying out the provisions of the patent law. At any rate we are satisfied that all routine business, such as that transacted by the various functionaries through whose hands patents pass, should be paid for by fixed salaries instead of fees on the patents which enter the offices. The *cost* of patents also involves the question of amalgamating the separate grants for England, Scotland, and Ireland, into one; for it is obvious that if the present system of granting separate patents be retained there must still be a triplication of officers for the performance of the several duties required, although it could be easily shewn that a more efficient administration of those duties would be effected, if there were but one channel for the passing of patents.

There is considerable difficulty in judging how far the high price of patents acts as a prohibition to the development of ingenuity; for it is no less true than strange that both prosperity and depression in trade have the effect, to a certain

extent, of lessening the number of applications for patents. When great activity exists in trade the manufacturer's attention is devoted entirely to producing by the means at his disposal—he has therefore no time for inventing. On the other hand, when trade is very dull his desire is to force the sale of his stock; and his means of production being greater than the demand, he cares little about facilitating production: it is the period between these two, when hope is growing, and leisure is available, that invention is most rife; but a great decrease in the number of patents granted invariably points out a period of great distress. We have been at some pains to find satisfactory evidence of the effect which high-priced patents produce on the inventive community, and we have at last hit upon a test which, as far as it goes, we think may be considered a fair one, and deserving of attention;—it is simply this,—a comparison between the number of patents applied for and those which actually pass the great seal. Now it is not to be supposed that there will be many applicants for patents who, for mere amusement, petition Her Majesty, and pay the preliminary expenses for the grant; but, on the contrary, all petitioners must be considered as *bonâ fide* applicants,—at least, so our experience dictates; and in that light, therefore, we shall consider them. If we refer to the return paper printed last year by order of the House of Commons, and containing the number of patents granted and fees paid thereon during the three preceding years, we shall find that in 1845 (which was a prosperous year) 575 English patents passed the great seal, and that 582 passed the privy seal (the stage of the patent's progress immediately preceding the great seal or last stage), seven having, consequently, been abandoned after upwards of £50 had been paid on each of them. But, from our own private sources, we find that in the same year there were 767* applications made, being an excess of 192 over the number sealed. Of these 192, which foundered in their progress to the great seal, we must suppose some were stopped by successful opposition before the Attorney or Solicitor-General; others were abandoned from want of utility or novelty by the inventors; and the remainder for want of funds to prosecute the patents to completion. As respects inutility or want of novelty—the latter being irrespective of suc-

* This number may vary some 10 or 12, either way, but for the present purpose it may be relied on.

cessful oppositions—we think but a small number of stoppages can be set down to these items; for, in the first place, a month or five weeks being the period which patents generally take to complete, there is little time for testing the invention; and as to the novelty, this the patent agent generally ascertains before the patent is commenced. If we deducted 5 per cent. on this ground it would be ample, and would make for the year 1845, say 38 abandoned as useless inventions. Now the proportion of oppositions made to the whole number of applications we have ascertained, by careful analysis, to be as 3 to 10, or, for the year 1845, say 230 patents were opposed, of which 1 in 10 (to state a very high average) was stopped, equalling 23 patents stopped by order of the Attorney and Solicitor-General. Our analysis, therefore, runs thus:—

English patents granted during the year 1845....	575
„ Applications abandoned by inventors as useless..........................	38
„ Ditto refused	23
„ Ditto accounted for	636
„ Ditto unaccounted for................	131
Total of applications.	767

Here then we have 131 or one 5.8th of the whole number of applications for the year 1845—and that, be it remembered, a prosperous year—abandoned for no other assignable cause than want of funds to complete the patents. It would be rather out of our province to place a probable value upon these abandoned inventions; but it is not too much to suppose that some of them were deserving a better fate, and that, if secured to their authors, might not only have enriched them personally, but conferred essential advantages on the public, either by opening new fields for labor, or facilitating the production of some useful manufactures. We may, however, look upon these inventions as lost, and many of the ingenious inventors are, doubtless, languishing under undeserved disappointment. But it may be said, that one isolated year is not a fair criterion of the result of the effect of high-priced patents; let us then take the year which has just closed, and see if that will make out a better case. In the year 1848, the patents which passed the great seal numbered 386, while

the applications were, for the same period, 596. By adopting our former estimate the numbers will stand thus:—

English patents granted during the year 1848....		386
„	Applications abandoned by inventors as useless	30
„	Ditto refused	18
		434
„	Stopped for want of pecuniary means....	162
	Total of applications	596

From this account we find, that inventors did not escape the general distress of the past year, for instead of the number of abandoned applications amounting (to state it roundly) to one-sixth of the whole number for the year as in 1845, we have now, in 1848, an increased amount, bearing hard upon one-third of the whole number, to which we can assign no other cause for their abandonment than the want of funds to complete the patents. In this estimate it must be remembered, that we have kept out of notice the hundreds of inventions which are thrown aside, or worked only in secret by their authors, without any steps having been taken to protect them; the cost of protection, by patent, being too great for the poor inventor, when once informed of the sum required, to trouble himself further about the matter, or to indulge even a hope that such pecuniary means will ever be in his power. Of such cases our experience furnishes us with almost daily instances, while it is but fair to presume that there is a very large number of workmen (the class from whence inventors principally emanate) who, from a knowledge of the barrier which poverty presents to them, never make known their position, but allow the discoveries, which an active mind or a quick capacity will furnish them with (although uncalled for), to remain undisturbed in their own brain, rather than throw them open to the world, and see others reap the fruits of their suggestions. The amount of distress among the operative classes which many of these immured inventions might tend to remove is almost incalculable; for it is certain, that a great depreciation in the price of manufactured goods will always create a demand; and how many an invention, which has never seen the light, might not, by shewing a more ready way of producing have cheapened the cost of manufacture,

created an extensive demand for goods so produced, and thus have called into activity the labor of thousands, whom the stagnation of trade had thrown into a state of destitution! In fact, it is the continued succession of improvements, following closely upon each other, that raises the ever-growing demand for manufactured products, and expands the capabilities of our manufacturing establishments for employing an amount of human labor proportionate to the increase of the population. Our national policy, therefore, as respects industry, should be to give ingenuity full scope to expand itself; and this we are satisfied can be done in no better way than by removing the restrictions under which the inventor has to labor; and acknowledging, not only by word but by deed also, that henceforth the productions of his genius, labor, and capital, combined, are to be regarded in the same light as all other descriptions of property, viz., as sacred and inviolable.

DESCRIPTION OF AN APPARATUS FOR CARBONIZING WOOD BY MEANS OF HEATED STEAM.

BY M. VIOLETTE.

[Translated for the London Journal of Arts.]

It is well known that the nature of the product of the carbonization of wood, in a close vessel, varies according to the temperature; for instance, a very great heat produces a black charcoal, deprived of the greater part of its volatile hydrogenated parts; whilst a more moderate heat gives a red charcoal, retaining more of the properties of wood, and still charged with volatile principles.* It is this latter quality of charcoal which produces the best gunpowder; and it is therefore important to discover the best means of preparing it. With this object in view, M. Violette has, by experiment, determined the limits within which a red charcoal may be obtained; that is to say, a product which is not wood, and yet is not perfect charcoal. To effect this object he employs a bath of metal, fusible at 160 degrees, composed of 1 part bismuth, 4 parts of lead, and 3½ parts of tin. This metal he keeps in fusion in a deep glass vessel, suspended over a Carcel lamp. A thermometer, graduated up to 350 degrees s immersed in this bath to shew the temperature. The pieces of

* For an account of M. Violette's experiments on the carbonization of wood, the reader is referred to a previous paper (Vol. XXXIII., p. 58,) of which this may be considered as a continuation.

wood to be experimented upon are fastened to the ends of platina wires, and put into glass tubes, closed at one end, and immersed in the metallic bath. By this arrangement the wood is maintained at the temperature indicated by the thermometer, and sufficiently protected from contact with the atmosphere. The wood may be withdrawn for inspection, when required, by means of the platina wires. A suitable and unvaried temperature may be maintained, by raising or lowering the wick of the lamp at the begining of the operation. The wood exposed in this apparatus during an hour to a temperature of from 200 to 250 degrees does not become converted into charcoal;—at the end of two hours, at the same temperature, it is converted into red charcoal, its surface being properly carbonized, but its interior being still wood; at the end of three hours it is converted into a hard red charcoal, brittle, and burning with flame, but incapable of extending its combustion; if submitted for an hour to a heat of 300 degrees a very good red charcoal is obtained, of sufficient hardness, but easily pulverizable; on the prolongation of the experiment to two hours a more perfect charcoal is obtained, which burns with flame; and, lastly; at a temperature of 350 degrees, and at the end of half an hour, a charcoal is obtained which is black, friable, and easily pounded.

The first experiments were made with a small apparatus, capable of containing about 2 lbs. of wood; and, independently of the superior quality of the powder manufactured with the charcoal thus obtained, it was found that the product was augmented to as much as 42 per cent. of the weight of the wood.

The apparatus now employed for this purpose is shewn in Plate II.; fig. 1, being a longitudinal vertical section; and fig. 2, a transverse section, in the line *a*, *b*, of fig. 1. It consists of two hollow concentric iron cylinders H, and K; in the inner one (K,) of which the wood to be carbonized is placed. C, is a coil of steam-pipe, communicating at one end with a steam-boiler, and at the other with the outer cylinder H. A, is the fire-place (which may be fed with wood or coke or other suitable fuel), wherein the steam-pipe is heated to any required degree of temperature. The cylinder H, is closed by a wrought-iron cover I; and the apparatus is provided with two outside cast-iron doors F, F, by which it is protected from the cooling action of the asmosphere. L, is a pipe, for letting off the steam and the products of the distillation of the wood from the cylinder K. G, is the flue, for the escape of the smoke from the fire-place A. The whole apparatus is surrounded by brickwork or masonry N.

The wood to be carbonized is first placed in a cylinder, made either of wirework or perforated metal, which is introduced into the cylinder K; by this arrangement, should the charcoal become ignited on being taken out, the flame will be prevented from

spreading. The charge in this apparatus weighs from 30 to 40 lbs.

Mode of Operation.—The first thing to be done is to get up the steam, until the manometer indicates one atmosphere; the fire-place for heating the steam-pipe is then to be lighted, and in about a quarter of an hour the doors may be opened, and the perforated cylinder, containing the wood, introduced into the cylinder K, which is then closed by means of the cover I; a luting of clay being made round the edge thereof, and a screw *m*, applied, to fasten the cover in its place: the outer doors may then be closed. After the lapse of ten minutes, when the luting has become sufficiently dried, the induction steam-cock is opened, and the steam rushes into the steam-pipe C, where it becomes heated; from thence it passes into the outer cylinder H, and into the inner cylinder K, at its open end; where it gradually insinuates itself into the pores of the wood, acting, by its great heat, in such a manner as to carbonize it, and finally makes its escape through the pipe L, carrying with it the gases evolved from the wood. In order to keep the fire at a certain temperature, there is a small glazed opening at *a*, through which the workman can see that the flame acts properly upon the steam-pipe. After some time a thermometer (specially constructed for the purpose), on being introduced into the cylinder K, shews that the temperature has reached such a height as to melt tin; and the steam which escapes shews, by its color and odour, that it is mixed with the first products of distillation of the wood, and that the carbonization has commenced. The smoke or vapour thickens, and takes successively various aspects, which are certain signs of the progress of the operation. After about two hours from the time the distillation was first apparent, the smoke shews that the operation is finished. The attendant then proceeds to discharge the charcoal; and for this purpose two other attendants are ready with what is called the *extinguisher*, a large iron cylinder, about three feet in diameter, and about six feet in length, to receive the charcoal. The chief attendant then shuts off the steam, opens the doors F, turns the screw *m*, lays hold, by means of wooden handles, of the respective ends of the cross bar J, which keeps the disc in its place, detaches it, and plunges it into a vessel full of water close by; then, by means of the same wooden handles, he takes hold of the disc, and twisting it round, so as to break the luting, detaches it, and plunges it also into the vessel of water. The attendants holding the extinguisher, put it in a horizontal position in front of the cylinder K, so as to close the orifice. The chief attendant then pushes a long rod through the pipe L, so as to push the cylinder, containing the charcoal, into the extinguishing cylinder, which is then quickly placed on the ground, and the hydraulic joint, with which it is provided, is filled with water. The operation is then completed.

The inventor has observed, that there are no traces of tar in the apparatus, as it is all driven off by the steam. The charcoal obtained is of very fine quality, and varies according to the temperature; that is to say, is *red* or *black*, according to the degree of heat and the length of time during which it has been maintained. The former is suitable for manufacturing the finer sorts of powder for sporting purposes, and the latter, inferior powder, for blasting mines, &c.

The apparatus, above described, has been in operation more than a year, and has produced 5000 lbs. of superior charcoal; and is now in very good condition.

Various modifications may be made in this apparatus without in any manner altering the main feature of the invention; for instance, the inventor proposes, in some cases, to use an apparatus containing three carbonizing cylinders, one of which shall not be supplied with steam, but merely serve to dry the wood, and prepare it for either of the other cylinders, on either side of the steam-pipe: this arrangement has the effect of rendering the operation continuous.—[*Bulletin de la Société d'Encouragement.*]

On the means of ascertaining and indicating the panifiable properties of wheat flour, by means of an instrument called the Aleurometer, invented by M. Boland, Baker, Paris.

Bakers in general, but more especially those of Paris, are dependant upon the millers for their supply of flour, and are, consequently, exposed to the chances of receiving from them an adulterated and inferior article; more particularly since the American mode of grinding, called *English grinding*, has been substituted for the old plan, by which the quality of the flour could be ascertained simply by the touch, as the coarser parts could be easily detected by experienced fingers,—thus giving a sure indication that it had not passed through the stones more than the requisite number of times, and in such manner as not to heat the flour; whereas, by the method at present in use, the grain is equally divided, and reduced to an almost impalpable powder, which, doubtless, facilitates its conversion into bread, but, at the same time, from its apparent fine quality, renders the detection of adulteration a matter of difficulty, even to experienced persons.

In order to arrive at a correct judgment of the quality of wheat flour, it is absolutely necessary to be well acquainted, not only with its nature and the properties of its component parts, but also the manner in which water acts upon them, in order to form a paste.

Wheat flour is almost wholly composed of starch and gluten, which act simultaneously in the process of panification; and

although the properties of these two bodies are now pretty well known, there are, nevertheless, certain of those properties which play a very important part in the process of panification, but have not hitherto received due consideration.

First, starch is insoluble in water at whatever temperature; but above 70° centigrades it expands and changes in form, which, from being regular, becomes irregular, and somewhat similar to vegetation, as will be seen by inspecting either starch of commerce or bread-crumb through a microscope. Thus starch as prepared for stiffening linen, &c., is not a solution, but a dilatation of starch in water, saturated with the soluble matters which it contains, in the same manner as bread-crumb, which may be considered as concentrated starch;—for the maximum dilatation of starch takes place in not less than fifteen times its weight of water; but more may be used, as starch is capable of expanding to thirty times its original volume. But, in panification, the starch, which does not possess the property of absorbing the water (being merely immersed in it, and kept damp by the gluten, which completely envelopes it, and forms cells, in which it is enclosed, giving up to it the excess of water with which it was saturated), can only dilate to a limited extent; and therefore starch does not play a very important part in the process of panification.

Gluten, on the contrary, has a great affinity for water, and will, at the ordinary temperature, without being dissolved, absorb a certain portion of it, which will be hereafter indicated. It is by means of this combination that it acquires the peculiar character of elasticity, which renders it fit for panification. It is, however, necessary that gluten, in order to acquire these elastic properties under the influence of water, should exist in the flour in a complete state of aggregation, which is susceptible of material alteration under various circumstances,—such as too rapid motion of the grinding surfaces, or their being placed too close together, by which means the gluten becomes heated, leaves the vegetating water prepared by its cohesion, becomes divided, and loses a portion of its elasticity; or, in panification, when fermentation has passed its alcoholic limit, a portion of the gluten is dissolved in the acetic acid which has been formed, and the other portion, which has escaped decomposition, no longer offers sufficient resistance to the disengagement of the carbonic acid; and the paste is not perfectly formed. It is therefore important that nothing should destroy the elasticity of the gluten. When exposed, in a thin hydrated layer, to the contact of the atmosphere, it loses its water of combination and vegetation, assumes a yellowish-grey color, and takes the appearance of isinglass; in this state it is, as before, insoluble in water; and, after remaining some time therein, it softens, and is only capable of regaining a portion of its former elasticity, while it

becomes less fitted for panification, and perhaps less nutritious; for it has been found that hydrated gluten is the most nutritious; but the heat necessary for baking the bread causes a change in the gluten, by which it parts with a portion of its water of combination. Gluten, however, to which about 30 per cent. of starch has been added, in order to dry it without fermentation, preserves its elastic property when reduced to flour;—that which results from starch manufactories, by mechanical washing, possesses this property, and may be employed with advantage in the making of bread, by mixing it with the flour in a pulverized state, or in the preparation of paste for other purposes; but, in order to verify its elastic properties, which may vary according to the state in which it has been prepared, it is indispensably necessary to submit it to the experiments hereafter mentioned.

Thus, of the two principal bodies composing wheaten flour, the gluten alone possesses the property of combining with water, in proportions which vary according to its state; and it is from this combination that its elasticity, so essential to panification, arises. The gluten divided or disaggregated does not readily combine with water, does not expand, and acts much in the same manner as starch simply surrounded with water; in this state it can only serve to promote fermentation, and will, consequently, prove injurious to panification, as it augments the products of fermentation, by destroying the elastic resistance without which the paste will not rise sufficiently. The absorption of water by the flour is the transformation most important to the baker, as it is necessary for the manufacture of the bread, and regulates the quantity which can be produced from a certain amount of flour. The water in mechanical combination with the flour must not however be confounded with that which it absorbs or combines with. The former does not in any way modify the properties of the bodies which compose the flour, and may be quickly driven off by evaporation; whilst the latter acquires new properties, and communicates them to the bodies with which it is assimilated.

Elastic gluten not only combines with water, but holds some in mechanical combination, which it gives up to the starch to facilitate its dilatation; but this dilatation of the starch is confined within very narrow limits, its maximum taking place only in a very large quantity of water.

Several experiments have shewn that in 26 grammes of flour, composed of—

	gr.	cent.
Starch, sugar, albumen, &c.	19	09
Dry gluten	2	64
Water of vegetation	3	27
	25 grammes	

and 12 gr. 50 of water to form the paste, the 19 gr. 09 of starch, sugar, &c. only absorbed 7 gr. 74 of water, whilst only 2 gr. 64 of dry gluten absorbed 4 gr. 76, of which 4 gr. 01 were in a state of combination and 0 gr. 75 free. It is this latter which the gluten gives up to the starch, as the starch loses by evaporation.

Flour which has commenced fermentation—that which has lost a portion of its water of vegetation by dessication (as is practised for sea voyages), and that which has been too much heated in grinding,—all these, although dry and thirsting for water, are capable of holding much less moisture than those which have retained their water of vegetation, as the gluten has become divided and lost a portion of its elasticity.

The result, therefore, of the combination of water with gluten is, that the gluten acquires all the necessary panifiable properties, especially the elastic resistance, by means of which the paste rises under the influence of the products of fermentation, but of fermentation stopped in time to prevent the decomposition of the gluten: chemists have given to this reaction the name of *panary fermentation*, a very vague designation, which does not explain any theory, but which will perhaps some day be more definitively settled by the help of science.

Thus it will be seen, that in order to ascertain the panifiable properties of wheat flour, it is necessary not only to verify the quantity of gluten which this flour contains, in order to judge of the nature of the grain from which it is made, but also to compare the elasticity of the gluten, so as to ascertain whether or not it has been injured by grinding, dessication, fermentation, or any other cause.

It is for the purpose of arriving at this latter and important result that the instrument, presently to be described, has been constructed. An instrument, similar in principle to the one now before the society, had been previously submitted, when several modifications or improvements were suggested by the committee of chemical arts, which have now been carried out.

Description of the Instrument called the Aleurometer.

This instrument, which is shewn in vertical section, in Plate I, is composed of an outside casing *a*, made slightly conical, and open at top to receive the pan or vessel *b*, which is heated by means of a spirit lamp below, and is rounded at bottom. This vessel *b*, is filled with oil (neats' foot is preferred) up to a level with the top of the case *a*. It is closed at top by a moveable cover *c*, to which is attached a pendant cylindrical case *d*, which is immersed in the oil when the apparatus is closed. This case *d*, is intended to contain the aleurometer, or a thermometer. The thermometer used is an ordinary one, graduated up to 200°, engraved upon glass in divisions of 50 degrees. Within the

case *d*, a cylinder *e*, is placed, which is closed at its lower end by a cup-piece *f*, which is screwed thereto; and at its upper end the cylinder is closed by a screw-plug *g*, through which a tube *h*, passes, graduated to divisions of 25 degrees, and provided at bottom, with an ungraduated part, equal in length to the thickness of the stopper *g*. This tube *h*, has a small circular plate *i*, at its lower end, and between this plate and the lower edge of the cylinder *e*, is an empty space, representing 25 degrees of the tube *h*, as shewn by the dotted line.

The outer casing, which serves as a heating apparatus, will not be required for the use of bakers, as all they need do is to place the vessel *e*, and its appendages upright in their ovens, which will answer the purpose of heating. The apparatus is constructed as shewn, for scientific purposes, it being more adapted for correct experiments than if heated in an oven.

Mode of proceeding.—A paste is prepared, composed of 30 grammes of flour and 15 grammes of water. These must be mixed with suitable apparatus, in such manner as not to lose an atom of flour. The paste is to be kneaded lightly in the hollow of the hand with the fingers, and from time to time dipped in water. It is finally submitted to the action of a stream of water, it being kneaded all the time, so as to be certain, when the water runs off clear, that the gluten is free from starch; it is then squeezed in the hand in order to express all the water mechanically combined with it; 7 grammes are then taken from it and made carefully into a ball, which is rolled in dry pulverized starch, or, better still, in fecula of potatoes, in order to prevent it from sticking. The ball of gluten, thus prepared, is put in the vessel *f*, at the bottom of the cylinder *e*; the vessel having been previously slightly greased. There is no occasion to grease the rod *h*.

During the kneading of the gluten the apparatus is heated by means of the spirit lamp, until a thermometer, placed in the tube *e*, indicates a temperature of 150 degrees, when it is to be taken out and the aleurometer put in its place. The spirit lamp is allowed to burn for ten minutes longer, and then put out; and in another ten minutes the gluten is removed, the number of degrees indicated by the rising of the rod *h*, having been carefully noticed.

The gluten, by expansion and evaporization of the water it contains, and which acts (although mechanically) in the same manner as the carbonic acid of fermentation, expands, rises, and solidifies, taking the form of the interior of the aleurometer; in doing which it first fills up the empty space of 25 degrees, which separated it from the rod, and then rises with sufficient force to raise this latter, sometimes even to its utmost extent, which is when the disc *i*, touches the bottom of the stopper *g*.

It may happen that the gluten does not rise up to the bottom

of the rod *h*,—*i. e.*, does not attain 25 degrees of dilatation; when this is the case it may be concluded that the flour, from which such gluten was obtained, is not fit for making bread.

M. M. Payen and *Chevreul* have shewn, in their course of lectures at the School of Medicine and the *Conservatoire des Arts et Métiers*, the theoretical and practical advantages which may be obtained from the use of this instrument.

The following is a table, shewing the results obtained with various kinds of flour by the aleurometer:—

Kinds of Flour.	Hydrated Gluten.	Dilatation of grammes of Gluten.
Flour from Étampes - -	33 per cent.	29 degrees
Do. do. - -	33 ,,	35 ,,
Do. Chartres - -	33 ,,	36 ,,
Do. Brie - -	35 ,,	32 ,,
Do. do. of 1842 -	38 ,,	29 ,,
Do. of wheat from Berg -	30 ,,	39 ,,
Do. do. - -	32 ,,	50 ,,

Gluten from a starch manufactory, dried and coarsely ground, gave .... 38 deg.
Ditto ditto ditto, ground fine, gave .. 50 deg.

From this it will be seen that starch-maker's gluten, extracted by washing, and well dried and ground, will retain its elastic and, consequently, panifiable properties for any length of time.

In the foregoing table, the quantity of hydrated gluten represents exactly the respective nature and quantity of the different kinds of flour, and the dilatation shews correctly the degree of deterioration which they have undergone in grinding, or from any other cause.—[*Ibid.*]

Report made by the Committee of Chemical Arts, on a substance for lubricating machinery, and on a mastic intended as a substitute for the minium mastic employed for luting the joints of steam-engines,—proposed by M. Serbat.

At the sitting of 2nd June, 1848, some notes presented by M. Serbat, manufacturer, at Saint-Saulve, Nord, were referred to the consideration of the Committee of Chemical Arts. By these he makes known the means he employs for obtaining various manufactured products; and more especially the two following, viz., 1st, a soap or grease made from the volatile products arising from the distillation of resin; and 2nd, a mastic for the purpose of luting the joints of steam-engines and pumps, and intended as a substitute for that prepared with white lead ordinarily employed,

and which is found to be very injurious to the persons using it, as it often produces cholic and other complaints. The object of this present report is to give an account of the examination we have made of these products, and the methods adopted for their preparation.

It is well known that since 1828, M. Dives conceived the idea of utilizing pyrogenous oils in general, and principally those resulting from the distillation of resins; also that he made known, that by mixing those oils with the various salts, subsalts, and metallic oxides, capable of acting upon those oils, consistency may be given to them, and they may be rendered more or less siccative by exposing the mixture, thus prepared, in thin layers, to the action of the air.

M. Dives, in a patent taken on the 17th September, 1828, declared that these properties, common to several salts, subsalts, and metallic oxides, appertain more especially to those which have lead for their base, and that he preferred to use these latter for the purpose of manufacturing his cement.

At a subsequent period MM. Payen and Buran occupied themselves with the preparation of a soap (known under the name of black grease), composed of pyrogenous oils and lime, and they took a ten years' patent for the same on the 30th January, 1838. It will be seen, on examining the description of this patent, published in the *Recueil*, that MM. Payen and Buran, finding that the essential oil obtained from resin by the ordinary means, did not produce a suitable result, *i. e.*, did not furnish a product fit for the production of the grease, conceived the idea of adding, in the distilling apparatus, lime in the proportion of from 5 to 10 per cent., and afterwards treating the oil obtained, with alkaline substances, as lime, potash, soda, or magnesia (but lime is preferred), in the proportion of from 2 to 5 per cent. to the weight of the oil, mixing the same in a *cold state;* care being taken to stir the mixture, and add the alkali a little at a time.

M. Serbat, as early as 1834, undertook researches with regard to resin oil. These researches were made in conjunction with MM. Fremy and Boutin; the object being the disinfection of resin oil, and its application to the purposes of painting, and to the manufacture of soap; but as those chemists did not obtain the results desired, this work was abandoned.

M. Serbat made fresh experiments, and, in 1839, he applied some processes which he had discovered to the manufacture of gas, at Belleville. Subsequently, in 1840, M. Serbat again took the subject of resin oils in hand, but with another object in view: he set up at Saint Saulve, near Valenciennes, an establishment for the preparation of various products, and formed a company at Brussels for the working of his processes. Unctuous matter for lubricating machinery was, at the request of M. Charvet, admitted at one of the expositions of arts and manufactures at Brussels, and a medal was awarded to the exhibitor. The grease,

manufactured at that time, consisted of oil of resin, brought to a state of consistency by fatty bodies and soap.

M. Serbat was led, by further experiments, to adopt a new mode of manufacturing a grease suitable for lubricating machinery, and he obtained, in 1846, a patent for working the same. His method of manufacture appeared to us rational and workmanlike, and may be thus described:—Resin is submitted to the process of distillation in suitably constructed apparatus, and the first products are separated; which consist of an oil suitable for use in painting; and which possesses the property of dissolving metallic soaps.

The product of 300 lbs. is about as follows:—

Essential oil for painting	13 lbs.
Oil for manufacturing grease..........	219 lbs.*

The oil, when obtained by distillation, is purified by the following means:—The oil from which the grease is to be manufactured is poured into a copper boiler, in which it is heated to and maintained at the boiling point for two hours, being first mixed with fragments of zinc, or hydrated lime, in the following proportions:—

Oil	97
Zinc	1
Or hydrated lime	1

The addition of these agents has for its object the separation, 1st, of the acids which may exist in the resin, or which may be formed during the operation; and 2nd, the clearing of the oil from the water which may haye passed off during distillation, and which is driven off in the form of vapour by boiling.

The oil, after being boiled, is drawn off while hot, and left to settle in copper vessels; and may, six hours after, be employed for the preparation either of the lime-paste or the grease. In fact the oil is divided into two sorts, one for the preparation of the lime-paste, and the other which is, by means of that paste, converted into grease.

The oil is poured into a reservoir, provided with two cocks, one above the other; the upper one serving to draw off the clear oil and the other the lees, which are not thrown away; the oil which they contain being separated from them by water and by heat.

Preparation of the Lime Paste.

For this purpose take of hydrated lime 18 lbs., oil 26 lbs. The oil is to be heated, and, when moderately hot, a portion of hydrated lime is added, it being incorporated therewith by stirring with an iron spatula, perforated at its upper part. When this portion is completely mixed, a fresh quantity is added, and

* All resins do not furnish the same quantity of oil; moreover the resins, as sold in commerce, are found to be adulterated with earth and sand.

so on until the whole is absorbed. The oil is to be only moderately heated, because if the heat were too great, and too much lime added, it would cause it to be puffed up by the development of gas. The vessel in which this operation is performed is of cast-iron, and is heated from underneath. The operation lasts about 12 hours, and is completed when the mixture has become limpid, and of a chocolate color;—in the dark it is phosphorescent.* This paste of lime, when cold, is fit for the manufacture of the grease, and preserves its properties for any length of time.

Manufacture of the Grease.

The paste of lime, having been prepared, is to be kept hot, and the grease is manufactured as follows:—20 lbs. of oil are to be poured into a vessel with a spout, and 2 lbs. of liquid paste of lime are to be poured into it, stirring briskly all the time; the mixture is then, after being well stirred, poured into casks or other suitable vessels, where it solidifies with a rapidity truly extraordinary,—the solidification taking place before it cools. It cannot be supposed that it is the lime which solidifies the oil, as the paste of lime is liquid; but there is no doubt that a particular combination is formed. The grease, thus solidified, will melt on being again heated, but will not afterwards solidify.

The advantages presented by grease thus manufactured are the following:—It is quickly prepared, its manufacture is uniform, it does not soil machinery, it is not viscous, and does not increase friction. Grease thus prepared may be sold at about 20*s*. per cwt.

The unctuous substance manufactured by M. Serbat, as far as we can judge from the books and correspondence of that gentleman, has been much approved of by manufacturers; the demand for it has gradually increased; and the quantity manufactured, which amounted, in 1840, to 20,000 lbs., was increased, in 1847, to 305,860 lbs. The substance thus prepared is also employed in Belgium, where M. Serbat has also a manufactory at Quiévrain.

We have also said that M. Serbat had occupied himself with the preparation of a mastic, intended as a substitute in the arts for minium mastic, the use of which is found injurious to the workman. We will give a description of his method of obtaining the product which, in our opinion, deserves the notice of the Society of Encouragement, in a sanitary point of view.

Preparation of the Mastic.

Take sulphate of lead, calcined and pounded....	144 lbs.
Peroxide of manganese of commerce, in powder..	48 ,,
Linseed oil	26 ,,

These substances are introduced altogether into a wrought-iron cylinder, mounted in bearings, and driven by means of a band from a steam-engine. Into this cylinder, with the above matters,

* It would seem that a more appropriate designation might be given to this product (which is liquid) than that of *paste of lime*.

egg-shaped pieces of cast-iron, weighing about 5 lbs. each, are thrown; the cylinder is then closed by a screw-plug, and caused to rotate for about an hour and a half; after which time it is opened, and 34 lbs. of manganese are added. It is then again rotated for three-quarters of an hour; after which the cylinder is again opened, and a fresh quantity of 34 lbs. of oxide of manganese is introduced. It is then again caused to revolve for another hour and a half; at the expiration of that time the cylinder is opened, and the mixture, which is simply agglomerated, is well pounded by means of stampers worked by steam. This is continued until the mixture has been rendered soft;—care being taken, during the operation, to move the mixture well about, so as to bring it all under the action of the stampers: the pounding must be continued for about two hours. This being done, the paste is placed in large vessels, and left to settle for about a fortnight; it is well piled up, and re-action allowed to take place. The vessels are to be covered with oiled woollen cloth. When a fortnight has elapsed, the paste is again placed in the cylinder, and a fresh quantity (for the above proportions) of 28 lbs. of oxide of manganese is added. The cylinder is then caused to revolve during an hour; the mixture is pounded for another hour, and the paste is replaced in the vessels, where it remains for a fortnight, or longer if it is not required to be used at the end of that time.

Before putting it into boxes for commercial purposes, the paste is taken from the vats, and again acted upon by stampers, for the purpose of softening it, and passed between two cast-iron cylinders, turned true, and mounted on an iron shaft, nearly in contact, for the purpose of clearing it of any lumps which may have escaped the action of the stampers. After passing through the rollers, the paste is again submitted to the stampers, by which it is rendered quite soft; it is then placed in boxes in quantities of from 10 to 200 lbs. The mastic will retain its softness for any length of time; and when required to be used, it is only necessary to knead it with the hands, no oil being required to be added. In this state the mastic may be employed for the same purposes as minium or white-lead mastic. This mastic, which is capable of being moulded easily, will not melt under the influence of heat, but is, on the contrary, hardened thereby, and becomes very firm; so that any joints luted with it will be more firm than when minium mastic is employed. Besides this, it is much more durable. This mastic may be sold at from 25*s.* to 30*s.* per 100 lbs.

The necessity of finding some substitute for minium mastic, which causes cholic, was so well understood that at the workshop at Angleur (Belgium) it was contemplated to make use of the zinc powder, which is found there in great abundance, and by this means mastic was prepared in the same manner as with white lead and linseed oil. This mastic made with zinc possesses, however, one disadvantage, which is, that it must be used directly, as

it hardens very rapidly, whereas M. Serbat's may be kept for any length of time.

Instead of the sulphate of lead usually employed, a compound may be used, the nature of which is not very well known, which is prepared by taking 80 lbs. of sulphate of lead of commerce, and 10 lbs of zinc filings, and calcining them on the bed of a reverberatory furnace, heated to a cherry-red heat, and keeping up that heat, stirring from time to time until the zinc ceases to burn; which shows that the metal is either oxidized or brought to a state of combination, the nature of which is yet unknown, but which would result from the reaction of the sulphate of lead upon the metallic zinc. It is of course understood that this product is not required for the manufacture of mastic; it is more especially employed for obtaining a grey pigment, much prized, and which will form the subject of further researches.

The mastic prepared by M. Serbat is a very valuable commercial product, it being employed in many establishments in the Departement du Nord; in Paris it is employed in the establishments of *MM. Delessert, Périer frères, Sommier, Gouin et Co.*, at the Mint, the Tobacco Manufactory, and on the Northern Railway.

The increasing favor with which this product has been received may be gathered from the fact that in 1845 the quantity sold was 16,996 lbs., in 1846, 36,962 lbs., and in 1847, 67,960 lbs. This mastic may also be used for filling up flaws in iron castings.—[*Ibid.*]

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1848.

Dec. 29. *George Forrester & Co.*, of Vauxhall Foundry, Liverpool, for a hydrant or slide valve for water pipes, fire-hose, and other purposes.

29. *Towns & Packer*, of 20, Oxford-street, London, for an improvement in the action of piano-fortes.

29. *John Bryce*, of Dunlop-street, Glasgow, plumber, for a hydrostatic pressure regulator.

30. *Julius Singer*, of 68, Princes-street, Leicester-square, for the portable wrapper vest.

1849.

Jan. 1. *Isaac Moses*, (trading under the firm of E. Moses & Son) of the Minories and Aldgate, London, for the duplex waistcoat.

1. *Charles Carr Williams*, of the Railway Carriage Works, Glasshouse-yard, Goswell-street, London, for a balance frame for door glasses or shutters for railway and common road carriages.

Jan. 3. *John Greenwood, jun.*, of Mold Green, Dalton, near Huddersfield, wood turner and shuttle maker, for a rack and pinion shuttle.

5. *Stock & Son*, of Birmingham, for the economic water-closet.

6. *Dixon, Sons, & Tooke*, of No. 37, Hatton-garden, for a safety clasp.

6. *Stock & Son*, of Birmingham, for the economic self-acting water-closet.

8. *Josiah Human*, of Ely, Cambridgeshire, civil engineer, for the rain protector.

9. *Butler & Co.*, of Walsall, for a bit for horses.

10. *George Henry Baskcomb*, of Manor House, Chiselhurst, Kent, for the extra improved triune dog-cart.

10. *Thomas Cartwright*, of Birmingham, for the ladies' improver or bustle.

11. *Simcox Pemberton & Sons*, of Birmingham, for blind furniture.

12. *Isaac Moses* (trading under the firm of E. Moses and Son), Minories and Aldgate, London, for the sternophylon or shirt and chest protector.

12. *Charles Otto Wilckens & Richard Hess*, of 15, James-street, St. Luke's, for a compound wrench.

13. *John Young*, of Wolverhampton, for a lock.

13. *George Dudley Ryder*, of Grace Dieu Warren, Leicestershire, for a double-bow suspension spring, for carriages.

13. *Charles Rickets*, of 5, Agar-street, Strand, London, for the economic gas cooking stove.

17. *Josiah Evans*, of Hay Dock Colliery, near Warrington, engineer, for an improved steam valve.

17. *Thomas Nash, jun.* of Southwark, Surrey, brush-maker, for an improved painter's brush.

18. *Charles Otto Wilckens & Richard Hess*, of 15, James-street, St. Luke's, for a marginal seal stamp.

19. *William Hattersley*, of 137, Ratcliff-highway, East, for the passenger's signal light.

20. *Joseph Tylor & Son*, of Warwick-lane, London, for an improved ball cock.

20. *Henry John Nicoll & Donald Nicoll*, of Regent-street and Cornhill, London, for a coat.

20. *Edward Frisby*, of 16, Marylebone-street, Golden-square, for the paragon boot heel.

22. *Thomas Craddock*, of Birmingham, for a pressure guage.

22. *Wm. Kenwright Harvey*, of Blurton, Staffordshire, for an apparatus for cleaning potter's materials from particles of iron.

Jan. 23. *Thomas Harris Busbridge & George Frederick Busbridge*, of East Malling Mills, Kent, for a dandy roller for paper-making.

23. *James Tasker*, of 41, South Castle-street, Liverpool, for the anti-collision signal lamp, for shipping and boats.

23. *John Hartley*, of the Mills, Otley, Yorkshire, for an improved mill.

23. *Deane, Dray, & Deane*, of King William-street, London-bridge, for a potato steamer.

25. *Mc Adam, Brothers, & Co.*, of Soho Foundry, Belfast, Ireland, for an excentric tappet for steam-engines.

25. *John Hynam*, of 6 & 7, Princes-square, Wilson-street, Finsbury, London, chemical light manufacturer, for a hexagonal hinged box, to be worked in metal for containing matches.

26. *William Riddle*, of East Temple Chambers, Whitefriars, London, for the *porte-flaçon*, or wine handle.

26. *William Dixon*, of 19, Williamson-square, Liverpool, dealer in glass, for an improved window ventilator.

26. *Ebenezer Rogers*, of Abercarn, Monmouthshire, engineer, for a rest, for the forward ends of loaded waggons or carriages while being tipped.

26. *Thomas Ash*, of Birmingham, for a fastening for stair carpets.

List of Patents

That have passed the Great Seal of IRELAND, from the 17*th December*, 1848, *to the* 17*th January*, 1849, *inclusive.*

To Duncan Mackenzie, of Goodman's-fields, in the county of Middlesex, manufacturer, for certain improvements in Jacquard machinery for figuring fabrics and tissues generally, and apparatus for transmission of designs to the said Jacquard machinery, parts of which are applicable to playing musical instruments, composing printing-types, and other like purposes,—being a communication to him from abroad.—Sealed 22nd December.

Bartholomew Beniowski, of Bow-street, Covent Garden, in the county of Middlesex, major in the late Polish army, for certain improvements in the apparatus for, and process of, printing.—Sealed 3rd January.

Joseph Simpson, of the city of Manchester, civil engineer, and James Alfred Shipton, of the same place, engineer, for certain improvements in steam-engines.—Sealed 5th January.

Charles Green, of Birmingham, in the county of Warwick, patent brass tube manufacturer, and James Newman, of Birmingham, manufacturer, for improvements in the manufacture of a part or parts of railway wheels.—Sealed 5th January.

Carey Mc Lellan, of Larch Mount, in the liberties of the city of Londonderry, for an improved corn mill.—Sealed 10th January.

William Edwards Staite, of Lombard-street, in the city of London, Gent., for certain improvements in lighting, and in the apparatus used therein, parts of which are applicable to other useful purposes.—Sealed 12th January.

William Young, of the firm of Henry Bannerman and Sons, of Manchester, in the county of Lancaster, merchant, for certain improvements in machinery or apparatus for winding, balling, or spooling thread, yarn, or other fibrous materials.—Sealed 12th January.

List of Patents

Granted for SCOTLAND, subsequent to December 22nd, 1848.

To Stephen Taylor, of Ludgate-hill, London, for certain improvements in the construction of fire-arms, and in cartridges for charging the same,—being a foreign communication.—Sealed 26th December.

George Ferguson Wilson, of Belmont, Vauxhall, London, and Charles Humphrey, of Manor-street, Old Kent-road, merchant, for improvements in the production of light by burning oleic acid in lamps, and in the construction of lamps, and manufacture or preparation of oleic acid for that purpose.—Sealed 28th December.

William Gilmour Wilson, of Port Dundas, Glasgow, engineer, for improvements in the formation of moulds and cores of moulds for casting iron and other substances.—Sealed 4th January.

Robert Angus Smith, of Manchester, for improvements in the application and preparation of coal-tar.—Sealed 4th January.

Edward Schunck, of Rochdale, for improvements in the manufacture of malleable iron, and in treating other products obtained in the process.—Sealed 8th January.

John Mitchell, chemist; Henry Alderson, civil engineer; and Thomas Warriner, farmer, of Lyons Wharf, Upper Fore-street, Lambeth, Surrey, for improvements in smelting copper.—Sealed 10th January.

John Wright, of Camberwell, Surrey, engineer, for improvements in generating steam and evaporating fluids.—Sealed 10th January.

David Yoolow Stuart, of Montrose, iron founder, for improvements in the manufacture of moulds and cores of moulds for casting iron and other substances.—Sealed 10th January.

Richard Roberts, of the Globe Works, Manchester, for certain improvements in and applicable to clocks and other timekeepers; in machinery or apparatus for winding clocks and hoisting weights; and for effecting telegraphic communication between distant clocks and places, otherwise than by electro-magnetism.—Sealed 11th January.

Edward Slaughter, of Avondale Iron Works, Bristol, engineer, for improvements in marine steam-engines.—Sealed 12th January.

Israel Kinsman, late of New York, but now of Ludgate-hill, London, for improvements in the construction of rotatory engines to be worked by steam or other elastic fluid,—being a foreign communication.—Sealed 12th January.

Edward Smith, of Kentish-town, London, blind manufacturer, for improvements in window-blinds, and in springs applicable to window-blinds, doors, and other like purposes.—Sealed 16th January.

Andrew Lamb, of Southampton, engineer, and William Alltoft Summers, of Millbrook, Southampton, engineer, for certain improvements in steam-engines and steam-boilers, and in certain apparatus connected therewith.—Sealed 16th January.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, London, civil engineer, for improvements in the construction of stoves, grates, furnaces, or fire-places for various useful purposes,—being a foreign communication.—Sealed 17th January.

James Hamilton of London, civil engineer, for improvements in cutting wood.—Sealed 17th January.

Andrew Shanks, of Robert-street, Adelphi, London, engineer, for an improved mode of giving form to certain metals when in a fluid or molten state.—Sealed 17th January.

James Young, of Manchester, chemist, for improvements in the preparation of certain materials used in dyeing and printing.—Sealed 19th January.

New Patents
SEALED IN ENGLAND.
1848-9.

To **William Gilmour Wilson**, of Port Dundas, Glasgow, engineer, for improvements in the formation of moulds and cores of moulds for casting iron and other substances. Sealed 30th December, 1848—6 months for inrolment.

William Knapton, of the City of York, ironfounder, for certain improvements in the mode of manufacturing gasometers or gas-holders. Sealed 3rd January, 1849—6 months for inrolment.

William Crofton Moat, of Upper Berkeley Street, Middlesex, surgeon, for improvements in engines to be worked by steam, air, or gas. Sealed 4th January—6 months for inrolment.

Robert Munn, of Stackstead Mill, Lancashire, cotton spinner, for certain improvements in looms and apparatus connected with looms for weaving various descriptions of textile fabrics. Sealed 4th January—6 months for inrolment.

William Thomas, of Cheapside, merchant, for improvements in the manufacture of window blinds,—being a communication. Sealed 4th January—6 months for inrolment.

David Yoolow Stewart, of Montrose, in the kingdom of Scotland, ironfounder, for improvements in the manufacture of moulds and cores for casting iron and other substances. Sealed 4th January—6 months for inrolment.

Henry Francis, of Chelsea, engineer, for improvements in sawing and cutting wood. Sealed 4th January—6 months for inrolment.

John Coope Haddan, of Bloomsbury-square, London, Middlesex, civil engineer, for an improvement or improvements in railway wheels. Sealed 5th January—6 months for inrolment.

William Rowe, of New Wharf, Whitefriars, London, carpenter and joiner, for certain improvements in the mode of uniting or combining pipes or lengths of pipes, tubes, or channels formed of glass, earthenware, or other similar material. Sealed 11th January—6 months for inrolment.

Michael Loam, of Treskerly, in the county of Cornwall, engineer, for improvements in the manufacture of fuzees. Sealed 11th January—6 months for inrolment.

Christopher Nickels, of the Albany-road, Surrey, Gent., for improvements in preparing and manufacturing india-rubber (caoutchouc). Sealed 11th January—6 months for inrolment.

Francis Hobler, of Bucklersbury, Gent., for improvements in the construction of the cylinders or barrels of capstans and windlasses. Sealed 11th January—6 months for inrolment.

James Castley, of Harpenden, in the county of Hertford, manufacturing chemist, for improvements in the manufacture of varnishes from resinous substances. Sealed 11th January—6 months for inrolment.

Robert Urwin, of Ashford, in the county of Kent, engineer, for certain improvements in steam-engines, which may in whole or in part be applicable to pumps and other machines not worked by steam power. Sealed 11th January—6 months for inrolment.

Miles Wrigley, of Ashton-under-Lyne, architect, for certain improvements in the manufacture of yeast or barm. Sealed 11th January—6 months for inrolment.

William Walker, of Manchester, agent, for certain improvements in machinery or apparatus for cleaning roads or ways, which

improvements are also applicable to other similar purposes. Sealed 11th January—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, civil engineer, for a certain improvement or improvements in the construction of wheels,—being a communication. Sealed 11th January—6 months for inrolment.

Obed Blake, of the Thames Plate Glass Company, residing at 13, Southampton-street, Strand, Gent., for certain improvements in ventilating or ventilators for or in ships, vehicles, houses, or other buildings. Sealed 11th January—6 months for inrolment.

Richard Laming, of Clichy-la-Garenne, near Paris, in the kingdom of France, chemist, for improvements in the modes of obtaining or manufacturing sulphur and sulphuric acid. Dated 4th September, 1848. Sealed 12th January—6 months for inrolment.*

William Betts, of No. 7, Smithfield-bars, in the City of London, distiller, for a new manufacture of capsules and of a material to be employed therein and for other purposes. Sealed 12th January—6 months for inrolment.

George Williams, of Tipton, in the county of Stafford, forge manager, for a certain improvement or certain improvements in preparing puddling furnaces used in the manufacture of iron. Sealed 13th January—6 months for inrolment.

Conrad Haverkam Greenhow, of the City of London, civil engineer, for certain improvements in atmospheric railways. Sealed 13th January—6 months for inrolment.

Richard Dugdale, of Brompton, in the county of Middlesex, engineer, for improvements in hardening articles composed of iron. Sealed 13th January—6 months for inrolment.

Jean Baptiste François Mazeline, ainé, of Havre, in the republic of France, engineer, for improvements in steam-engines, and in the machinery for propelling vessels. Sealed 16th January—6 months for inrolment.

William Martin, of St. Pierre-les-Calais, in the republic of France, mechanist, for certain improvements in machinery for figuring textile fabrics,—parts of which improvements are applicable to playing certain musical instruments, and also to printing, and other like purposes. Sealed 16th January—6 months for inrolment.

Peter Augustine Godefroy, of London, chemical colour manufacturer, for certain improvements in dressing and finishing woven fabrics. Sealed 16th January—6 months for inrolment.

Anthony Barberis, of Leicester-square, engineer, for improvements in spinning silk, and in the construction of swifts, and in the arrangement of apparatus for winding silk and other

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* This patent having been opposed at the Great Seal, was not sealed till 12th January, 1849, but bears date 4th September last, by order of the Lord Chancellor.

fibrous substances. Sealed 16th January—6 months for inrolment.

Edward Buchler, of the City of London, merchant, for improvements in the manufacture of boots and shoes,—also applicable to other fabrics,—being a communication. Sealed 16th January—6 months for inrolment.

Carey McClellan, of Larch Mount, in the liberties of the City of Londonderry, for an improved corn-mill. Sealed 16th January —6 months for inrolment.

James Hamilton, of London, civil engineer, for improvements in cutting wood. Sealed 18th January—6 months for inrolment.

John Francis Bottom, of Nottingham Park, Nottingham, lace dresser, and John Dearman Dunnicliff, of Hyson-green in the parish of Radford, lace manufacturer, for improvements in dressing or getting up fabrics of cotton or silk and of cotton and silk combined. Sealed 18th January—6 months for inrolment.

Francis Alton Calvert, of Manchester, mechanist, for certain improvements in machinery for cleaning and preparing cotton, wool, and other fibrous substances. Sealed 18th January—6 months for inrolment.

Thomas Newcombe, of Bermondsey, machinist, for improvements in furnaces. Sealed 18th January—6 months for inrolment.

William Boggett, of St. Martin's-lane, Middlesex, manufacturer, for improvements in methods and machinery for obtaining and applying motive power. Sealed 20th January—6 months for inrolment.

Henry Bernoulli Barlow, of Manchester, consulting engineer, for improvements in the manufacture of cut piled fabrics, and in machinery or apparatus applicable thereto,—being a communication. Sealed 20th January—6 months for inrolment.

Samuel Brown, the younger, of Lambeth, Surrey, engineer, for improved apparatuses for measuring and registering the flow of liquids and of substances in a running state; which apparatuses are in part also applicable to motive purposes. Sealed 20th January—6 months for inrolment.

Henry Needham, of Vine-street, Piccadilly, in the city of Westminster, gun-maker, for certain improvements in fire-arms. Sealed 20th January—6 months for inrolment.

Thomas Robinson, of Leeds, flax dresser, for improvements in machinery for breaking, stretching, cutting, hackling, dressing, combing, carding, drawing, roving, and spinning flax, hemp, tow, wool, silk, and other fibrous substances; and in uniting fibrous substances. Sealed 23rd January—6 months for inrolment.

Charles de Bergue, of Arthur-street, West, in the City of London, engineer, for improvements in steam-engines, in pumps and in springs, for railway and other purposes,—being a communication. Sealed 23rd January—6 months for inrolment.

Edward Slaughter, of the Avonside Ironworks, Bristol, engineer, for improvements in marine steam-engines. Sealed 23rd January—6 months for inrolment.

Rees Reece, of London, chemist, for improvements in treating peat and obtaining products therefrom. Sealed 23rd January —6 months for inrolment.

Charles Henry Paris, of Paris, in the republic of France, manufacturer, for improvements in preventing the oxidation of iron, —being a communication. Sealed 23rd January—6 months for inrolment.

William Henry Barlow, of Derby, civil engineer, for improvements in the construction of permanent ways for railways. Sealed 23rd January—6 months for inrolment.

Richard Johnson, of Blackburn, in the county of Lancaster, Gent., for certain improvements in the manufacture of malted grain and in vinous fermentation; also improvements in brewing, and in the machinery or apparatus connected with the above or similar processes. Sealed 23rd January—6 months for inrolment.

Wakefield Pim, of the borough of Kingston-upon-Hull, engine and boiler maker, for certain improvements in propelling ships or vessels. Sealed 25th January—6 months for inrolment.

Robert Shaw, of Portlaw, in the county of Waterford, cotton spinner, and Samuel Fletcher Cottam, of Manchester, machinist, for certain improvements in machinery for preparing, spinning, and doubling cotton, wool, flax, silk, and similar fibrous materials. Sealed 25th January—6 months for inrolment.

John Talbot Tyler, of the firm of Ashmead and Tyler, Mount-street, Grosvenor-square, hatters, for certain improvements in hats, caps, and hat-cases. Sealed 25th January—6 months for inrolment.

Pierre Frederick Gougy, of Paris, in the republic of France, Gent., for improvements in apparatus and machinery for lifting and moving heavy bodies, and for raising and displacing fluids. Sealed 27th January—6 months for inrolment.

Richard Archibald Brooman, of Fleet-street, in the city of London, for certain improvements in the manufacture of artificial limbs, —being a communication. Sealed 27th January—6 months for inrolment.

James Green Gibson, of Ardwich, near Manchester, machinist, for certain improvements in machines used for preparing to be spun, and spinning cotton and other fibrous substances, and for preparing to be woven and weaving such substances when spun. Sealed 27th January—6 months for inrolment.

CELESTIAL PHENOMENA FOR FEBRUARY, 1849.

D.	H.	M.	
1			Clock before the ☉ 13m. 36s.
—			☽ rises 11h. 32m. M.
—			☽ pass. mer. 6h. 57m. A.
—			☽ sets 1h. 19m. M,
2	7	36	♃'s first sat. will im.
	8	40	♃'s second sat. will im.
3	9	0	☽ in Perigee
4	10	8	♀ in the ascending node
	21	46	☿ in the ascending node
5			Clock before the ☉ 14m. 20s.
—			☽ rises 3h. 2m. A.
—			☽ passes mer. 10h. 50m. A.
—			☽ sets 5h. 44m. M.
	21	9	♃ in oppo. to the ☉
6	22	52	♃ in conj. with the ☽ diff. of dec. 3. 17. N.
7	11	16	Ecliptic oppo. or ○ full moon
	17	6	♃'s first sat. will em.
	23	29	☿ greatest elong. 18. 10. E.
9	11	19	☿ in Perihelion
	11	45	♃'s first sat. will em.
	14	10	♃'s second sat. will em.
10			Clock before the ☉ 14m. 32s.
—			☽ rises 8h. 56m. A.
—			☽ passes mer. 2h. 20m. M.
—			☽ sets 8h. 41m. M.
11	6	13	♃'s first sat. will em.
12			Occul. 95 Virginis, im. 10h. 24m. em. 11h. 18m.
13	22	6	☿ stationary
14			Mercury R. A. 22h. 47m. dec. 5. 10. S.
—			Venus R. A. 0h. 44m. dec. 5. 14. N.
—			Mars R. A. 19h. 24m. dec. 22. 48. S.
—			Vesta R. A. 1h. 8m. dec. 1. 13. N.
—			Juno R. A. 5h. 19m. dec. 6. 34 N.
—			Pallas R. A. 17h. 33m. dec. 6. 52. N.
—			Ceres R. A. 17h. 49m. dec. 21. 39. S.
—			Jupiter R. A. 9h. 17m. dec. 16. 52. N.
—			Saturn R. A. 23h. 41m. dec. 4. 13. S.
—			Georg. R. A. 1h. 12m. dec. 7. 1. N.
—			Mercury passes mer. 1h. 9m.
—			Venus passes mer. 3h. 3m.
14			Mars passes mer. 21h. 46m.
—			Jupiter passes mer. 11h. 37m.
—			Saturn passes mer. 2h. 3m.
—			Georg. passes mer. 3h. 34m.
15			Clock before the ☉ 14m. 25s.
—			☽ rises 1h. 12m. M.
—			☽ passes mer. 6h. 5m. M.
—			☽ sets 10h. 52m. M.
—			Occul. B.A.C. 5579, im. 16h. 29m. em. 17h. 49m.
	4	3	☽ in □ or last quarter
	7		☽ in Apogee
16	13	39	♃'s first sat. will em.
	16	47	♃'s second sat. will em.
17	10		Vesta in conj with ♅ diff. of dec. 5. 16. S.
18	8	7	♃'s first sat. will em.
19	11	21	♂ in conj. with the ☽ diff. of dec. 4. 49. S.
	19	13	☿ greatest hel. lat. N.
20			Clock before the ☉ 14m. 0s.
—			☽ rises 5h. 29m. M.
—			☽ passes mer. 10h. 5m. M.
—			☽ sets 2h. 45m. A.
22			☉ eclipsed, invis. at Greenwich
	7	36	♃'s third sat. will em.
	13	33	♀ in conj. with ♅ diff. of dec. 2. 20. N.
	14	57	☿ in conj. with the ☽ diff. of dec. 3. 19. N.
23	1	30	Ecliptic conj. or ● new moon
	13	41	☿ in inf. conj. with the ☉
	15	33	♃'s first sat. will em.
24	3	10	♄ in conj. with the ☽ diff. of dec. 0. 54. S.
25			Clock before the ☉
—			☽ rises 13m. 18s.
—			☽ passes mer.
—			☽ sets
	10	2	♃'s first sat. will em.
	13	5	♀ in conj. with Vesta diff. of dec. 7. 40. N.
	19	5	♅ in conj. with the ☽ diff. of dec. 2. 47. N.
26	0	39	♀ in conj. with the ☽ diff. of dec. 5. 42. N.
27			Occul. B.A.C. 830, im. 6h. 51m. em. 7h. 39m.
	8	43	♃'s second sat. will em.
28	17		☽ in Perigee

J. LEWTHWAITE, Rotherhithe.

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RECENT PATENTS.

To Nathaniel Beardmore, *of No.* 13, *Great College-street, Westminster, in the county of Middlesex, civil engineer, for his invention of certain improvements in founding and constructing walls, piers, and breakwaters; parts of which improvements are applicable to other structures.*—[Sealed 3rd July, 1848.]

This invention is designed to facilitate the erection and construction of submarine works, when it is required to obtain a good foundation and solid superstructure of brickwork or masonry and other materials, intended to form the substance of such works. For this purpose the patentee employs a caisson or enclosure, constructed so as to float, with a portion of the structure built therein, to the spot where the wall, pier, or breakwater is to be placed, and to constitute a part of the permanent work, which may be proceeded with to completion with more expedition and convenience and less liability to damage than is usually experienced in such structures. By the combination and arrangements hereinafter described, the necessity for a separate floating vessel or body (to be afterwards detached), to ensure a greater stability in the work in the early stages of its progress, is dispensed with.

The object of the invention is further to adapt and apply a part of the above-mentioned improvements to the construction of floors and foundations.

The caisson or enclosure employed for the founding and constructing of walls, piers, and breakwaters, consists of wrought-

iron plate bottom, sides, and ends, and occasional transverse bulkheads, strengthened by ribs, and firmly connected together, so as to withstand pressure in every direction, for floating the walls and other materials from the place of construction to the site of the proposed work; the whole being so bonded together as to constitute one entire frame of great strength, solidity, and power of resisting strains.

The bottom of the caisson is formed of boiler-plates, rivetted together so as to form one uniform sheet, to which is connected by angle-irons, firmly rivetted thereto, a series of vertical plates, extending the whole width of the caisson. To the upper part of these vertical plates a second set of angle-irons are rivetted, so as to cause a ledge or shoulder to project therefrom on each side, by which cells are formed, to be afterwards filled in with concrete, brickwork, masonry, or other material, fit to resist the displacement of the plates; such concrete or other material being pressed or built and well grouted close against the plates and into the angles; the combination thus forming a solid foundation and uniform mass to receive the superincumbent structure. The sides and water-tight transverse bulkheads are formed of boiler-plates, rivetted together, and strengthened by vertical and horizontal ribs or frames of ordinary angle and T-iron; the whole being united to the bottom by means of strong angle-irons and knees or strengthening pieces, and the sides throughout being braced together by means of iron plates and beams of iron and timber, so as to form one combined structure.

During or after the construction of the framework of the caisson, which may be done in any convenient harbour or sheltered place, the sides, ends, and bulkheads are to be stayed by strong walls built within the sides, longitudinally and transversely, and bonded with the ribs, beams, and tie-plates, to give general stiffness. At this stage of progress the caisson may be floated to the site and there sunk, when it will at once constitute a solid foundation and material part of the permanent work.

The part of this invention having reference to floors and foundations consists, in applying arrangements of plates, and filling in of the cells or spaces formed by them (similar to those already described for the bottom of the caisson) to the construction of flooring, such as floors of warehouses or other buildings, and the bottoms of locks, and other cases where great strength may be required.

The manner of carrying the invention into effect will be clearly understood by the following description, reference

being had to the figures in Plate IV. Fig. 1, is a transverse vertical section of the caisson, representing the general arrangement of its parts, and mode of combining them with its skeleton walls, and part of the complete pier or breakwater. Figs. 2, and 3, are longitudinal sections on the lines A B, C D, and E F, of fig. 1; and fig. 4, is a plan or horizontal section of the caisson at various levels. In these several figures portions of the detail are omitted for the sake of perspicuity. Fig. 5, is a general elevation and sectional view; and fig. 6, is a general plan, on a smaller scale, shewing the form of the iron shell, the position of the bulkheads and skeleton walls, and the manner in which two caissons are brought together to form a pier or breakwater. *a*, *a*, is the base plate of the caisson; *b*, *b*, are the vertical transverse plates, firmly rivetted to the bottom plates by angle-irons *c*, *c*; and *d*, *d*, are the upper angle-irons, rivetted to the vertical plates, so as to form projections for the purpose of retaining in the spaces *e*, *e*, concrete, brickwork, or other similar material, as shewn in figs. 2, and 3. At *f*, *f*, fig. 1, are shewn keelsons, and at *g*, *g*, are angle or T-irons; all of which run longitudinally, and are rivetted to the angle-irons *d*, *d*, running transversely to give strength to the floor. These keelsons and angle or T-irons may be used in greater or less number, as may be found necessary. *h*, *h*, are the outer sides of the caisson, and *j*, *j*, the inner plating, dividing the whole structure into three longitudinal divisions, whereof the centre division is to form the heart or core of the ultimate structure or permanent work, and the outside divisions are to form the permanent walls, enclosed between the double sides *h*, *h*, and *j*, *j*. Water-tight bulkheads, constructed similarly to the sides, are to be placed transversely, as shewn at *m*, *m*.—*k*, *k*, are skeleton walls: they are represented generally at fig. 6, as they would be arranged to give stiffness to the caisson, both transversely and longitudinally, and to its double sides *h*, *h*, by means of contreforts *l*, *l*, *l*, at short intervals. At *n*, *n*, are angle and T-irons, which are used vertically as frames or ribs, forming, with the plate iron, rivetted thereto, the sides and bulkheads of the caisson; *y*, *y*, are knees or angle-plates for securing the bottom to the sides; *o*, *o*, are horizontal ribs of angle or T-iron; and *p*, *p*, are T-shaped ribs, to be firmly rivetted to the side plating and the vertical frames, so as to give the most complete stiffness and strength to the structure. *q*, *q*, figs. 1, 3, and 4, are tie-plates, and *r*, *r*, are beams for tying the sides together, and efficiently binding the walls and concrete. At *s*, *s*, are indicated transverse beams for tying and stiffen-

ing the central compartment of the caisson; at *t, t,* are diagonal and vertical struts; and at *v, v,* longitudinal beams, bolted together at their several junctions, and firmly connected to the sides by plates rivetted and bolted to them, or by other means, as shewn at *w, w,* figs. 1, 2, and 4. The whole system of bracing being designed to enable the caisson to resist strains in every direction. It will be seen, on reference to fig. 2, that the transverse tie-beams *s, s,* are of timber and iron, ranged alternately, so that the timbers being principally used as stays against pressure from without, they may be removed at pleasure when the caisson is fixed, and used for the scaffolding and railways required in the construction of the work, or for any other purposes. It is manifest that the particular arrangement and number of the braces, beams, and ties, may be varied according to circumstances, and will have to be adapted to the particular requirements of each case. The depth and width of the caisson, and the slope of the sides must likewise be adapted to the depth of water, rise of tide, and other features, at the site of the intended work, and with reference to the nature of the bottom, which, if necessary, will have to be previously levelled by dredging or other suitable means. The bottom of the caisson may likewise be adjusted, in some degree, in its form and relative angle with the sides, to the slope or nature of the ground on which it is to be sunk. The kind and form of wrought-iron plates, angle-irons, and T-shaped iron, and the mode of rivetting, and generally the manner of constructing the iron floors, beams, braces, knees, scarfs, and plating, and other details in the machinery and implements for rivetting and securing the whole in a workman-like manner, are to be similar to those adopted by boiler-makers and iron ship-builders.

The manner in which the wall, pier, or breakwater, is to be completed within or under the protection of the above-described caisson is as follows:—In the first instance the cells *e, e,* of the bottom are to be filled in with concrete, of strong materials, or brickwork, or masonry, or any other strong and cementing material. The walls and contreforts are then to be built (before the caisson is floated to its destination), according to the general arrangement shewn by dotted lines at *k,* and *l,* to as great a height as the draught of water will permit;—taking care that they are built up uniformly, and adjusted so as to give balance and stability to the caisson, and that in all cases the central-wall is built up to the first tier of beams. In some cases it may be found

desirable to introduce hollow work into these walls, for the sake of lightness. The outer, central, and cross walls *k*, *k*, may be built of any strong and durable kind of masonry or brickwork, set in good cement or hydraulic mortar; but good brickwork, set in Portland cement, mixed with a due proportion of sand, is preferred;—hoop-iron being inserted frequently, and attached to the caisson-frames by bending into holes, which should be made for this purpose. The outside walls, for from 5 to 10 feet below the level of low water, should be formed with good stone masonry, as within this space the exterior iron shell may be subject to decay.

During the construction of the foregoing works, it will be necessary to provide proper bilge-pumps and water-ways from every compartment of the caisson, with engines for keeping the same free from water, and likewise valves for the admission of water. The caisson is now to be towed to its place of destination, and there sunk by admitting water or loading the central division with stone or shingle. The spaces at *x*, *x*, figs. 4, and 6, are then to be filled up with thoroughly good concrete, made of hydraulic lime and shingle, or such like material. A good concrete, for this purpose, may be made of about eight parts of clean gravel or shingle and one part of Portland cement. The sides *j*, *j*, figs. 1, and 2, are made to extend above high water-mark, so as to enclose a space, which may be kept dry by pumping while the timbers are being removed; this will afford the facility of at once constructing a barrier to the sea, sufficient until the outer walls are complete, by filling the central divison with any cheap material of a hard nature; but concrete is preferred to be used, especially in the upper part; this concrete to be thrown down in layers of not more than three feet in one week, the caisson being kept free from water while this is done. The outer walls may then be completed with masonry of granite or other stone, well dowelled and bonded by iron straps, attached to the frames of the caisson, and the whole finished off as shewn at figs. 1, and 5, or in any other manner usually practised, by means of railways, traversing-frames, cranes, or other machinery, which may be erected on the beams of the caisson. If any portion of the wall has to be completed below low water-mark, it must be done by diving-bell or divers, as customary in such cases. The length of the caissons and constructions, as prepared according to this invention, are proposed to be from 300 to 800 feet, or even more, if convenient places can be got wherein to build them; but they should have water-tight bulk heads, at intervals of from 80 to

150 feet, with walls of brickwork against them, in the manner represented at figs. 2, 3, and 4.

A succession of these caissons may be laid end to end, as shewn at figs. 5, and 6, to form a pier or breakwater of any length, and the spaces left between two caissons may be left open or bridged over, or filled in with masonry, as may be found most suitable. For greater stability of the whole work, it may be desirable to throw in rock or other cheap material against the sides of the caisson, as shewn at fig. 9; but it will be unnecessary to deposit such above the level of low water.

The modified form of caisson represented generally at figs. 7, and 8, and in transverse section at fig. 9, is intended to be employed for works on a smaller scale. The upper works are to be proceeded with under cover of the sides, after the caisson has been settled in the place which it is permanently to occupy. The general arrangement and construction of this caisson, as to its essential features, is similar to that above described, but the staying and bracing must be of great strength, as the caisson is of weaker form, and will have to be kept empty for longer periods.

The last part of the invention, which refers to the adaptation and application of iron plates and filling (arranged similarly to the bottom of the above-described caisson) to the purpose of forming a floor or foundation for buildings, is shewn at figs. 10, 11, and 12. Fig. 10, is a transverse section of a portion of the flooring, and fig. 11, is a side view of the same, shewing the manner in which it is inserted into the side wall of the building. *a*, is the horizontal base-plate; *b*, *b*, are the vertical transverse plates, rivetted to the former by angle-irons *c*, *c*; *d*, *d*, are double angle-irons, rivetted to the upper part of the plates *b*; and *e*, is the concrete, brickwork, cement, or other material, as hereinbefore described, placed so as to fill up the space between the plates *b*, and effectually prevent their displacement. By this arrangement great strength for sustaining weight is given to the flooring, with comparatively thin plates *b*, *b*, and *a*, *a*.—*f*, *f*, are earthenware pipes or hollow work, of any suitable kind, introduced in order to lessen the weight of the floor; or the filling material may be arched, as shewn by the dotted lines *l*, *l*. It will be seen that in the figures there is shewn, by dotted lines at *g*, *g*, an extension of the plates *b*: this arrangement is intended to give additional strength, when necessary, with the same weight of concrete.

At fig. 12, another form of base-plate *a*, or support for the

concrete *e*, is shewn; it consists of an arch-plate, which is kept in place by means of screw-bolts and nuts *h*, *h*, without necessarily being rivetted to the bottom angle-irons. By this arrangement the plate *a*, can be easily drawn into an elliptical form, as represented in the figure, so as to save weight; and when the concrete or cement is set, the whole becomes suspended and firmly united to the sides of the vertical plates by the combined effect of the bolts *h*, *h*, and the arch-plate *a*. It will be seen also that hollow pipes can be introduced, in order to lessen weight; and tie-bars, as shewn at *k*, or in any other suitable manner, may be placed from beam to beam at intervals.

The patentee, in conclusion, states that he does not claim the use of caissons, generally, in building walls, piers, or breakwaters, or floating parts of such structures to and sinking them at the site of the proposed works; but he claims, Firstly,—the founding walls, piers, and breakwaters upon a base, consisting of a combination of wrought-iron plates and solid filling, arranged as above described. Secondly,—the founding and constructing walls, piers, and breakwaters by means of a caisson, with a bottom and double sides of wrought-iron plates, combined and arranged, as above described, in reference to figs. 1, to 6. Thirdly,—the founding and constructing walls, piers, and breakwaters by building a portion of such structures within, and together with, a caisson of wrought-iron plates, arranged and combined as above described, so as to float such portion of the structure and, when sunk, to form a part of the permanent work. Fourthly,—the constructing floors and foundations by means of wrought-iron plates and suitable filling, combined and arranged as above described.—[*Inrolled January*, 1849.]

To William Edward Newton, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for an invention of an improvement or improvements in making coupling-joints for pipes, nozzles, stop-cocks, still and cylinder-heads, and other apparatus,—being a communication from abroad.*—[Sealed 22nd March, 1848.]

This invention relates to an improved means of connecting together tubes or pipes for the conveyance of water, steam, gas, or other fluids or liquids, and is also applicable to fastening on the ends of steam or other cylinders or vessels, securing still-heads, connecting shafts together, and to nearly every

purpose where parts of various kinds of apparatus require to be connected together by bolts or screws passed through flanges.

In Plate VI., the means of applying this improved fastening, which the inventor terms the "clasp coupling-joint," to various purposes is clearly shewn. Figs. 1, 2, 3, and 4, represent in elevation, plan, vertical section, and perspective views, one of the improved clasp couplings, as applied to the coupling of pipes; figs. 5, 6, and 7, are elevation, plan, and vertical section of the invention, as applied to the securing of a cap-plate on to a quadrangular vessel; and figs. 8, and 9, are a vertical section and plan, representing a modification of the invention as applied to the coupling of small pipes.

The principle or character of the invention consists in forcing together the two bodies to be coupled or connected, by means of a grooved segmental or other clamp, according to the form of the parts of the vessel or article to be coupled. The groove of the coupling embraces the flanges or their equivalents, which project from or are connected with the bodies to be coupled; so that when the said grooved segments are drawn together by screw-bolts, keys, conical wedge rings, or any equivalent means, the groove therein shall act on the said flanges or their equivalents, so as to force them together, and thus make a tight joint, with or without interposed packing.

In figs. 1, 2, 3, and 4, *a, a,* represent two sections of a steam or other pipe, each provided with a turned or upset flange *b,* with packing *c,* of any kind, interposed; but, if desired, the packing can be dispensed with, by facing the flanges, or making what is termed a ground joint. At the junction of the two pipes an inner pipe *d,* is introduced within the pipe, to serve as a guide in joining the flanges together; but this may be dispensed with if desired. Over the two sections of the pipe, and extending over the flanges, are two rings, one for each section, the inner faces of which correspond or nearly so with the faces of the two flanges, and are curved or bevilled on their outer faces. These rings should be made to fit somewhat closely on to the sections of pipe, or may be shrunk on if desired. When the two flanges and rings are put together, face to face, they are embraced by a segmental clamp *f, f,* made in two parts, the inner periphery of which is grooved to embrace the rings *e, e,* and to act on the outer curved or bevilled faces thereof; so that when the said segments are drawn together by means of screw-bolts *g, g,* that pass through ears *h, h, h, h,* which project from their ends,

the sides of the grooves are made to act in a wedge-like manner on the outer curved or bevilled faces of the rings *e, e,* to force them and the flanges of the sections of the pipe together, and there hold them firmly. In this way it will be seen that the flanges are forced and held together around the entire circumference by the use simply of two bolts; thus effecting a better joint, which can be connected and disconnected in less time, and held with more strength, than by the means heretofore employed.

Instead of forcing together the segments of the clamp by means of screw-bolts, as above described, this can be done by means of a ring *i,* as represented at figs. 8, and 9, the inner periphery of which is made conical, so that it may be driven on to the segmental clamp, the outer periphery of which is made of a corresponding conical form. In these figures the parts corresponding with those represented in the figures above described are indicated by similar letters. The patentee remarks that the conical clamping-ring for forcing together the segments of the clamp-ring, as a substitute for the clamp-screws, has been tried for coupling small water and gas pipes, and been found to answer the purpose; but this modification will also be found to answer for coupling large pipes and other articles. Instead of the clamp, screw-bolts, or conical rings, keys, or other modes of drawing or forcing together the segments of the grooved clamp, may be substituted. The rings *e, e,* that extend over the flanges may be dispensed with, and the grooved segmental or other clamp may be made to act directly on the flanges; but it is better to use the rings, as they can be more readily adapted to the groove of the segmental clamp, and at the same time give strength and support to the flanges, which, in general, are formed by turning over and upsetting the metal of the pipe. If desired, packing of any kind may be interposed between the flanges and the rings; but this in general will not be found necessary. Care should be taken to leave the groove in the segmental clamp of greater depth than the projection of the flanges and rings, to give ample room for drawing together the segments; and care should also be taken to have the curve or bevil of the outer face of the rings, or of the flanges (when rings are not used) of greater or less curve or bevil than the groove of the segmental clamp, so that in forcing them together the segments of the groove may act in the manner of a double wedge, to force together the rings or flanges. The curve or bevil of the groove is preferred to be made more acute than the faces of

the rings or flanges, so that, in wedging them on, the sides of the groove may act on the rings or flanges nearer to the periphery of the pipe than would be the case if this state of things were reversed.

The improved coupling is equally applicable to the coupling of the parts of angular articles, and an example of this is given at figs. 5, 6, and 7, which represent a mode of attaching or coupling the cap on to a quadrangular vessel. In these figures the upper edge of the vessel *k*, is provided with a projecting flange *l*, with the under face rounded or bevilled, and the upper edge of the cap-plate *m*, is similarly rounded or bevilled to correspond therewith; and these, when put together, either with a close fitting (ground) joint, or with packing interposed, receive the grooved clamp *n*, which is made in four parts, each part fitted to one of the angles of the vessel; and these sections, which are provided with projecting ears *o*, *o*, are then drawn together by means of a screw-bolt *p*, and thus couple and bind together the vessel and its cap, making a tight joint all round. Instead of uniting the sections at the four faces of the square, they may be united at the angles. From this example it will be clearly seen that this improved coupling is applicable to vessels and other articles of angular or curved forms; and that, whatever may be the form, any desired and effective mode of drawing or forcing together the segments of the grooved clamp may be substituted for screw-bolts or the conical rings.

In coupling angular vessels or other articles it will be found to be advantageous to make the grooved clamp in as many sections as there are sides to the figure; and for round couplings it will be found sufficient to make it in two parts for all articles of moderate size; but when the diameter is very considerable it may be divided into three or more parts. This improved mode of coupling is equally applicable to the securing of nozzles, stop-cocks, and many other articles not necessary to enumerate, and particularly to cylinder-heads, in which the edge of the head takes the place of one of the flanges.

It will be evident to any engineer or machinist, from the foregoing, that shafts and other solid bodies can be coupled together in the same manner as hollow conduits or vessels, and with equal advantage, and by a similar arrangement of parts, and therefore it is deemed unnecessary to give an example. The flanges, instead of being solid projections of the bodies to be united, may be made separate, and connected therewith in any manner desired, as the mode of making the flanges forms no part of the invention.

The leading advantages of this mode of coupling over the ordinary double flange and bolts heretofore and now generally used are stated to be, a great reduction in the number of screw-bolts used, which occupy much time in connecting and disconnecting joints, particularly in the parts of steam-engines, such as the cylinder-heads, and other parts which require to be frequently connected and disconnected for packing and other purposes; also increased strength, and more perfect and continuous support, as the flanges, by the improved plan, instead of being reduced in strength by the numerous bolt-holes, are pressed together, and supported all round by the grooved segmental clamp; and the strain on the threads of the screw-bolts, instead of being in the line of the force which tends to separate the coupling, as in the old plan, is nearly at a right angle therewith, and therefore greatly relieved.

The patentee claims the coupling of joints by means of flanges, or their equivalents, in combination with a grooved clamp, the groove of which is formed to embrace the flanges; and which clamp, when drawn or forced together by screw-bolts or other equivalent means, will force and hold together the flanges of the parts to be connected, and thereby form a firm and secure joint.—[*Inrolled September*, 1848.]

To Henry Archer, *of Shaftsbury-crescent, Pimlico, in the county of Middlesex, Gent., for improvements in matches, and in the production of light, and in the apparatus to be used therewith.*—[Sealed 24th June, 1848.]

This invention relates, in the first place, to a mode or modes of making matches, to be used as tapers, which, when lighted and required to be used for sealing letters, or other similar purposes, may, without trouble, be made to stand up in a vertical position (until they are consumed) by their own gravity merely.

In Plate VI., two modes of carrying out the object of this part of the invention are shewn. Fig. 1, represents a small taper-match, intended to burn from two to ten minutes, according to its size, or a sufficient length of time to seal two, three, or more letters, as may be required. It consists of a conical piece of wax, or other suitable material, with a small wick running up the centre, and somewhat resembling an ordinary wax match, with some inflammable composition at the upper end, for the purpose of igniting the taper-match by means of friction, or otherwise, as is well known. At the

bottom of the cone is a piece of metal, wood, paper, cloth, or other material suitable for preventing the melted wax or composition from running about when the match is nearly burned out. From the peculiar shape of these taper-matches, it will be seen that they will readily stand on their base; and even if carelessly placed on a table they will have a tendency to assume a vertical position. Fig. 2, represents another form of taper-match, made on the same principle; the only difference being, that the taper is cylindrical instead of conical, as in the former instance. Fig. 3, represents another mode of carrying out the principle. In this instance the match is of the ordinary form of wax matches; but its lower end is inserted in a small block of lead, or other heavy material, which acts as a base or holder, to support the match in a vertical position while in use. Preference is given to lead, or such other heavy malleable and soft metal or material as can be readily stamped or moulded into the required form; as cheapness, and also weight to keep the match in its proper vertical position, are both points of importance.

The second part of the invention relates to the preparation of hydrocarbons, or other similar inflammable liquids, by the admixture therewith of other liquids, so that when the said hydrocarbons are used for the production of light they will not be so liable to smoke or throw off quantities of unconsumed carbon as when used pure, as is usually the case at present when employed for illuminating purposes. In order to effect the above object, the patentee takes one part, by measure, of ordinary camphine or coal-tar naphtha, and adds thereto two parts, by measure, of wood naphtha or pyroxylic spirit. By combining these materials in the above or nearly the above proportion, an inflammable liquid will be produced, which will burn with great brilliancy, and yet will not be so liable to throw off dense masses of smoke as the pure camphine. He does not, however, confine himself to the above proportions, as they must be varied according to the purity or impurity of the hydrocarbon employed; for instance, it may sometimes be found necessary to add as much as three parts of pyroxylic spirit to one of coal-tar naphtha or camphine; and sometimes equal quantities of camphine and pyroxylic spirit will give a good result for general purposes and under ordinary circumstances; but the proportions above stated are preferred.

The third part of the invention relates to improvements in night-lights. In manufacturing the night-lights a thin me-

tallic or other case, as shewn at figs. 4, and 5, is provided, to contain either the mixture of inflammable liquids above mentioned, or vegetable or animal oil, or other combustible material. A small aperture is left in the top; but when the case is filled with the combustible liquid, the aperture is covered over, as seen in the plan view, fig. 5, by means of a small piece of paper, or other impervious material, which can be easily perforated by a pin; and when the light is required for use it will only be necessary to open the hole in the top of the metallic or other case and insert a wax wick, as shewn at fig. 4, in the drawing. It will be found that the wick, when ignited, will give a brilliant, economical, and steady light for some hours, according to the quantity of oil or inflammable material contained in the case. It is unimportant of what material this case is made; but as economy is a great desideratum in articles of this description, the patentee proposes to employ metal cases, made after the plan adopted by Mr. Rand for the manufacture of his collapsable metal tubes, for containing paints and other materials; he does not, however, confine himself to the use of this kind of case, as cases made of thin tin or brass, or even vessels made of wood or earthenware, with a thin metallic cover, will answer the purpose, and may be refilled with inflammable material and used a second time. A very useful portable lamp may be made upon the same principle as that just described and shewn in figs. 4, and 5, for night-lights, by making the cases a little stronger and larger, and increasing the size or number of the wicks for such a purpose: however, the oil case should be enclosed in another case or socket, with a suitable handle and other conveniences, as will be understood by any intelligent manufacturer.

Fig. 6, represents another mode of making a night-light. It consists in inserting, in a glass or other transparent vessel, containing oil, one of the taper-matches (shewn at fig. 3,) as a wick, which, by being weighted at the base, will stand in a vertical position in the oil, as seen at fig. 6, and will gradually burn down as the oil is consumed; the flame always remaining at the proper altitude above the surface of the oil.

The fourth part of the invention relates to the construction of pressure-lamps. Lamps to burn oil have heretofore been constructed to work by means of weights or springs, which, by acting on a piston that is made to press upon the surface of the oil, cause the latter to flow up a long tube to the burner; but, in lamps constructed according to the present invention, the pressure acts in the opposite direction, as will

be seen by referring to fig. 7, which represents a transverse vertical section of the improved lamp. The oil or other inflammable liquid to be consumed is contained in a flexible bag or case *a*, made of any suitable impervious material, such as bladder, or silk rendered impermeable by means of caoutchouc or other similar gummy matter that is not liable to be quickly acted upon by the oil. This bag is furnished, at its lower end, with a flat disc *b*, of metal or other suitable material, which is made to pass easily up or down a cylindrical outer metal case *c, c*; and to the upper end of the flexible bag or oil-case a second disc *d*, is secured. This disc *d*, is furnished with a wick-holder *e*, which may be detached therefrom by unscrewing, in order to insert a new wick when requisite, and also to supply the oil-case *a, a*, with oil. A coiled spring *h*, is enclosed in the external metal case *c*, and acts against the under side of the disc *b*, of the oil-case, and therefore is always exerting its force to press the disc *b*, upwards, and thereby collapse the oil-case between its upper and lower discs *d*, and *b*. A gallery *f*, and glass shade or globe may be adapted to the lamp, if required, as shewn in the figure. The effect of this arrangement will be, that the oil or other inflammable matter to be consumed will always be kept up to the wick to a point very near the point of ignition; and therefore a steady and brilliant light will be produced as long as any oil remains in the case *a*. It should be observed, that the outer case is furnished with a cap-piece *g*, which screws on to its upper end, or may be secured thereon by a bayonet-fastening; and against the under side of this cap-piece the upper disc *d*, is constantly pressed by the action of the coiled spring *h*. Now, when it is required to fill and trim the lamp, the cap-piece *g*, should be removed, and the oil-case taken out; then, by unscrewing the wick-holder *e*, the oil may be easily poured into the case; and when filled, the wick-holder *e*, is to be screwed on again, and the case replaced in the tube or external case *c, c*. In order to do this, however, it is necessary to pull down or collapse the coiled spring *h*; and this is effected by means of a cord *i*, which is attached, at one end, to the under side of the cup at the upper end of the spring; and, at the opposite end, it is secured to a small barrel *j*; on the axle or spindle of which is a small ratchet-wheel *k*, furnished with a pall or click *l*. When it is required to collapse the spring, the barrel *j*, is turned round several times by means of a small winch or handle applied to the spindle, so as to coil the cord around the barrel; and the spring will be prevented from acting by means of the ratchet-wheel, which

prevents the barrel from uncoiling the cord. When, however, the flexible oil-case is placed in the tube *c*, and the lamp is required to act, the spring *k*, must be released, by lifting up the click *l*, by means of a small lever or handle on the opposite side, and thereby allowing the cord to uncoil, and permit the spring to act against the under side of the oil-case, and keep the wick constantly supplied with oil.

The last part of the invention refers to a mode of ornamenting the chimneys and shades or globes used for lamps or gas-burners of various constructions. This improvement consists in corrugating the chimneys and globes, either spirally or horizontally, as shewn at figs. 8, and 9. By thus ornamenting the chimneys and shades a novel effect is given to the flame.

The patentee claims, Firstly,—the making of taper matches in the manner shewn, whereby the said matches, when lighted and in use, may be made to stand in a vertical position, without extraneous aid, either from the fingers or by fixing the end of the match in a hole in the lid or other part of the match-box, as is usually the case. Secondly,—the preparing of camphine and other hydrocarbons, by mixing therewith wood naphtha or pyroxylic spirit, for the purpose of rendering the same more useful for illuminating purposes. Thirdly,—making night lights in the manner herein shewn and described. Fourthly,—the construction of pressure-lamps for burning oil or other inflammable liquids, in which the said inflammable liquids are contained in a flexible bag or case, from which the said liquid is supplied to a wick by means of pressure exerted externally. Lastly,—the ornamenting of glass chimneys and globes for lamps generally, by corrugating them obliquely or horizontally, as shewn in the drawings.—[*Inrolled December*, 1848.]

To Walter Orbell Palmer, *of Southacre, near Swaffham, in the county of Norfolk, farmer, for improvements in machinery for thrashing and dressing corn.*—[Sealed 10th July, 1848.]

This invention consists in combining a thrashing-machine and a dressing-machine together, in such manner that corn shall be thrashed and dressed by one machine.

In Plate VI., fig. 1, is a longitudinal vertical section of the machine, and fig. 2, is a transverse vertical section, taken on the line A, B, of fig. 1. The machine is to be mounted on four wheels, in order that it may be readily transported

from one place to another; and it is to be worked by a steam-engine or other suitable first mover. *a*, is the place where a man sits, for the purpose of feeding the machine with corn through the opening *b*; *c*, is the thrashing-beater; *d*, is the small straw-shaker; and *e*, is the large straw-shaker. *f*, is an endless band, on to which the corn falls, as it is thrashed out, and it is carried thereby into the trough or receiver *g*; and it is raised out of the trough *g*, by the chain of buckets *h*, which throw it down the inclined shoot *i*, on to the sieve *j*, of the dressing-machine. The patentee remarks, at this point of his description, that the thrashing-machine and dressing-machine are similar to those in common use, and therefore he does not claim them, separately, as new. *j*, is a sieve, for separating the short straw from the corn; *k*, is a spiked roller, for assisting the separation of the short straw; *l*, is the hopper of the dressing-machine; *m*, *m*, are the ordinary sieves of the dressing-machine, which receive a shaking motion from the axis *n*, of the flyer or fan *o*, by means of the rod *p*; and *q*, is a screen, through which the dressed corn falls into a receptacle beneath. Motion is communicated from a steam-engine, or other first mover, by means of endless bands, to the axes b^1, and *r*; and from thence it is transmitted, by endless bands and toothed gearing, to the other axes of the machine, which are caused to revolve in the directions indicated by the arrows. The sieve or riddle *j*, is mounted on two springs *s*, and the front part is raised and lowered quickly by means of the rod *t*, connected to a crank on the axis *n*, of the flyer or fan *o*; the upper end of the rod *t*, is attached to one end of the lever *u*, the other end of which is connected by a strap *v*, to a bar affixed across the outer end of the riddle *j*; and the quick up-and-down motion, imparted by this means to the riddle, is regulated by the springs *w*, carried by the bar *x*, on which the outer end of the riddle beats. The endless band *f*, is made of strong canvass or other suitable material, and rods of wire are secured transversely across it (by sewing), so as to keep it distended to the proper width.

The patentee claims, as his invention, the so combining of a thrashing-machine with a dressing-machine, that the corn, being thrashed out, shall be moved by suitable apparatus towards the dressing-machine, and then elevated in the manner described, and passed through the dressing-machine; and he also claims the mode of applying a riddle for separating the short straw from the corn before it passes into the dressing-machine.—[*Inrolled January*, 1849.]

To Joseph Clinton Robertson, *of Fleet-street, in the City of London, civil engineer, for an improved method of constructing boats, ships, and vessels of wood,—being a communication.*—[Sealed 17th August, 1846.]

In constructing boats according to this invention a number of skeleton frames, similar to the ribs of a boat, are first made from a draught or model, and accurately formed upon their outer edges to coincide with the lines of sections taken at various parts throughout the whole length of the intended boat. Fig. 1, in Plate VI., shews one of the frames; and fig. 2, exhibits the mode of combining a number of frames together. a^1, a^2, a^3, a^4, a^5, are the frames, which are fixed to a floor or to blocks placed on the ground, so as to form an exact model or counterpart of the inside of a boat turned bottom upwards; and the model thus made may be used in the construction of any number of boats. In each of the frames *a*, at that part which corresponds with the bottom of the boat, there is formed a groove or notch *b*, for the reception of the kelson *c*. The piece of timber, of which the kelson is made, should be so long as to form also the apron or stemson *d*, and the rise at the stern or sternson *e*; for a boat 20 feet long and 5 feet broad, it should be made of straight-grained oak plank, 5 inches broad and 1½ inch thick; and it is to be bent to the requisite form upon the model frame in the following manner:—The side of the kelson which lies downwards in the groove *b*, is to be rounded on the edges, and the outside of the ends which form the apron or stemson *d*, and the sternson or dead wood *e*, is to be bevilled off from the centre towards each edge, so as to form a bed for the reception of the ends of the external planking; the kelson is next to be steamed, to prevent it from cracking on being bent into its place upon the moulding-frame; after which, it is to be secured upon the frame, by first passing one end, say that at *d*, through a hole in the floor or a mortice in a block, where it is fixed by wedges in the line of the groove *b*, then bending the kelson into the grooves, and finally fixing the other end, by wedges, either in the floor or in a block. The upper or gunwale strake *f*, is now fitted to its place: for a boat of the dimensions above given, it should be made of straight-grained oak, 2 inches broad and 1¼ inch thick. The planking that forms the shell of the boat is put on in strips 1¾ inch broad; and if straight-grained pine or cedar timber is used, the planking should be 1 inch thick. The first strip of planking *g*, is fixed to the gunwale strake *f*, either by nails

or screws, which are made to enter at one edge, and, after passing through the strip in the direction of its breadth, to enter the gunwale strake *f*, in the same direction. The ends of the strips are fastened by nails or screws to the stemson and sternson;—the ends of those on one side of the boat being half-lapped over those on the other side. Each successive strip is secured to the preceding one in the way just described, until the last or garboard strakes are arrived at; which strakes will generally require to be tapered at the ends; and they may be secured to the preceding strips by nails or screws, passing through them in the direction of their breadth, but diagonally through the kelson.

The boat, after being smoothed over with a plane, will have assumed its proper external form without any nails or screws being visible, excepting those at the stemson, sternson, and garboard strake, which will all be covered by the operation next to be described. For this purpose, and also for forming the keel, the stern, and the sternpost, a strip or rod of wood, 2 inches thick and 3½ inches broad, and in one continuous length, if possible, is used;—the ends being made with a double bevil upon that side intended to go next to the boat, with the inclinations of the bevilled parts tending towards the centre of the piece of wood, so that the same may fit close upon the ends of the strips *g*. The stern and sternpost are first adjusted and secured in their places, by fixing each end with wedges in a hole in the floor or in a block; then holes are bored through the keel, the garboard strakes, and the kelson, and the whole effectually fastened together by bolts, passed through these holes and secured inside by nuts or rivets; and the same means are employed for fastening the stern and sternpost to the boat.

When it is desired to strengthen the boat by timbers inside of the shell thus formed, the moulding-frames must be proportionably reduced in size; and the timbers are to be placed upon the moulding-frames, and the planking secured thereon in a similar manner to that above described. It will not be necessary to caulk a boat made according to this invention; but if any shrinking appears after it is completed, the surface and joints or seams may be well "served" with a coat of white lead and oil, made of a suitable consistence to run into the seams; or marine glue may be used. The planking of the boat is stated, in the above description, to be commenced from the gunwale strake; but it may be commenced with equal facility from the garboard strake, as shewn at fig. 3.

This invention also consists in constructing a boat in such

manner as to render the same more buoyant, and to cause it to discharge any water which may be shipped over the gunwale. Fig. 4, is a transverse section of a boat constructed according to this part of the invention; and fig. 5, is a perspective view of the boat, drawn upon a smaller scale. *a, a,* are two air-tight chambers, the roof of which is formed by the flooring *b,* of the boat; they are divided in a longitudinal direction by the kelson; and the capacity of the chambers is such that the load water-line of the boat is below the flooring. *c, c,* are passages, which descend from the flooring *b,* to the bottom of the boat, and are open to the water beneath, but do not communicate with the interior of the air-tight chambers *a, a.* Any water which may come into the boat will be immediately discharged through the passages *c, c,* on account of the level of the flooring *b,* being higher than that of the surface of the water outside of the boat. The water is prevented from entering the boat through the passages *c, c,* by valves at *d, d,* which open only in a downward direction. *e, e,* are two air-tight compartments, one at each end of the boat, which, from their elevated position, cause the boat, in case of being upset, to right itself immediately.

The patentee claims, Firstly,—the constructing of boats, ships, and vessels on skeleton model frames, as above described. Secondly,—the mode or modes of giving the necessary curvature to the different parts, as above described. Thirdly,—the mode or modes of firmly securing the whole of the parts together, as above described. Fourthly,—the mode of giving buoyancy to the same, as above described.—[*Inrolled February,* 1847.]

To Lewis Dunbar Brodie Gordon, *of Abingdon-street, Westminster, civil engineer, for an improvement or improvements in railways.*—[Sealed 9th May, 1848.]

The first part of this invention consists in forming the ends of rails in such a manner that, when they are fixed in the chairs, the end of one rail shall rest upon the end of the adjoining rail;—the object being to prevent the end of one rail from rising above the end of the other rail.

In Plate VI., figs. 1, 2, 3, and 4, exhibit several rails, having the ends formed with what the patentee terms the "underlap joint," which is produced by making the end of one rail with a projecting piece *a,* and the end of the other rail with a corresponding portion cut out or deficient, as at *b.* For

single-headed rails, the joint is formed at the lower part thereof, as shewn at figs. 1, 2, and 4; and for double-headed rails, which are intended to be turned over when one side becomes worn, the joint is made at the central part of the depth of the rails, as at fig. 3. To prevent the rails from travelling through the chair, a stop may be formed upon the latter, as shewn at *c*, figs. 1, and 2. When the ends of the rails have been badly cut, or when the bearing-surfaces have become worn, the ends may be adjusted to the same level by the use of a piece of hoop or other iron, in the manner represented at *d*, fig. 4.

The second part of this invention consists in a peculiar manner of adapting thin plates of malleable iron to form transverse or longitudinal sleepers for supporting the rails of railways.

Fig. 5, represents, in partial sectional elevation, a transverse sleeper, made of a thin plate of iron; and fig. 6, is a section, taken on the line A, B, of fig. 5. To form a sleeper, the patentee takes a plate of iron, of suitable length, from one-sixth to one-quarter of an inch thick, and from ten to sixteen inches wide; in this he punches a hole at the middle, and two or more holes at the parts where the chairs are to be fixed; and then he bends the plate into the form of an arc (in its transverse section), having a radius of from 18 to 36 inches, or so that there is a concavity of from 1¼ in. to 2½ in., according to the width of the plate. Having prepared moulds for the two chairs at the required distance apart, the patentee places the sleeper with the corresponding holes over the moulds of the chairs, which he then casts, using enough metal to form a thickness of half an inch or so of cast-iron inside the sleeper: the chair and sleeper are thus securely connected without bolts or rivets. The sleeper is strengthened by a brace *d*, which is put in its place before the chair is cast, and is fixed by the metal of the chair. The brace *d*, is connected at its centre with a malleable iron king-post *e*, the end of which is inserted in the centre hole of the sleeper, and fixed therein by casting a button of iron around it.

Fig. 7, is a side view of a longitudinal iron sleeper, with chairs attached to it, and a common H-rail in the chairs; and fig. 8, is a transverse section of the same. Fig. 9, is a transverse section, exhibiting the application of a longitudinal sleeper of sheet iron for supporting a bridge-rail;—the bed for the rail being a continuous casting (with bolt-holes fifteen inches apart or thereabouts) upon the sheet-iron. As the length of the plates or sheets of iron is limited, the patentee proposes (in order to insure a uniform degree of support to

the rails) to place a plate, marked *f*, in fig. 7, beneath the ends of every two adjacent sleepers: this plate, which is to be of the same strength as the bearers and about 18 inches long, is bent, so that its convex side fits the concave side of the sleepers; and it extends an equal distance beneath the ends of each sleeper. Transverse tie-rods of iron are used for connecting each longitudinal sleeper with the neighbouring sleeper, in order to preserve the gauge of the line of railway.

The third part of the invention consists in a mode of strengthening the rails at the joint by means of a trough or other girder of malleable iron. Fig. 10, is a longitudinal vertical section of part of a rail; and fig. 11, is a plan view of of the same, shewing the way in which this improvement is applied. The two chairs next the joint are made with a projecting part at one side, on which the ends of the trough girder *g*, rest; and this girder serves to support the ends of the rails.

The last part of this invention consists in a peculiar mode of securing the rails in the chairs; and also in a method of preparing wooden railway keys. The rail is secured in the chair by means of a screw, (as shewn at *h*, in fig. 12, which works through a nut, and presses against a wooden key or other elastic medium; a thin piece of iron being interposed between the end of the screw and the key. The nut fits into a recess cast in the chair; and there is a slot, for the purpose of allowing the screw and nut to be taken out or put in without unscrewing. When wooden keys are used, the patentee prepares them in the following manner:—He makes a varnish by boiling any of the drying oils, for several hours, with a quantity of red lead, equal to from one-sixteenth to one-twentieth of the weight of the same; and then he raises the temperature of the oil to about 450° Fahr., and steeps the keys therein: the keys, thus prepared, will not be changed in bulk either by dry or moist weather.

The patentee claims, Firstly,—forming the ends of rails in such a manner that the end of one shall rest upon the end of another in the manner described. Secondly,—the manner of adapting thin plates of iron to form sleepers for supporting rails, as described, combined with the mode of fastening the chairs to malleable iron sleepers, as above described. Thirdly,—the mode of supporting the ends of the rails by means of a girder, as described. Fourthly,—the arrangement for fastening the rails in the chairs, above described. Fifthly,—the mode of preparing keys for railways in the manner described.—[*Inrolled November*, 1848.]

To John King, *foreman to Messrs. Shears and Sons, of Bankside, Southwark, and* Henry Medhurst, *operative engineer to the said Messrs. Shears and Sons, for improvements in gas-meters.*—[Sealed 26th July, 1848.]

This invention consists, firstly, in certain improvements in the apparatus described in the specification of a patent granted to Joseph Gray, August 17, 1846, for the purpose of regulating the motions of the diaphragms of dry gas-meters, so as to prevent the same, after having completed a movement in one direction, from returning suddenly, and thereby causing the lights, which are supplied with gas by the meter, to become unsteady; secondly, this invention consists in certain apparatus for communicating the motions of the measuring parts, of both dry and wet gas-meters, to the registering apparatus.

In Plate V., fig. 1, is a vertical section of a dry gas-meter, with one moveable diaphragm, constructed according to the first part of this invention; fig. 2, is a section, taken on the line A, B, of fig. 1; and fig. 3, is a side elevation of a pair of the valves employed for admitting the gas into or discharging it from the measuring-chambers of the meter. *a*, is a moveable partition of metal, affixed to a vertical spindle *b*, which carries at its upper end a cross-bar *c*. One end of the crossbar *c*, is embraced by the forked end of a weighted lever *d*, mounted on an axis d^1; the weighted end of which lever resists the forward movement of the plate *a*, and thus obliges the flexible part a^1, of the partition, to return or move first from the extremity of its range; by which means greater uniformity of registration and steadiness of light are obtained. This improvement is not confined to single diaphragm gas-meters, but is applicable to all gas-meters having moveable diaphragms. To the other end of the bar *c*, is affixed a plate *e*, which is connected by a link *f*, with a plate *g*, that slides in the guides *h*; the plate *g*, is formed with a slot in it, to receive the stem of the weighted lever *i*; and it is by the to-and-fro movement of the plate *g*, carrying the lever *i*, just beyond a central position (when it will fall over by its own weight), that the change in the position of the valves is effected. This is accomplished in the following manner:—*j*, j^1, and *k*, k^1, are the inlet and outlet-valves to the two measuring compartments of the meter; these valves are enclosed in two chambers *l*, l^1, one of which is connected with the gas supply-pipe and the other with the gas exit-pipe;

each pair of valves turns on an axis *m*, and is furnished with two horns, projecting upwards on either side of a plate *n*, attached to an axis *o*, and this axis passes through a stuffing-box in the side of the valve-chamber into the part of the meter containing the apparatus whereby the various movements are effected. The axes *o*, are connected to the bent bar *p*, which has a slot or opening formed in it, to receive the stem of the lever *i*; and when the lever *i*, is thrown over in either direction, by means of the link *f*, the lever *i*, will fall against one or other end of the opening in the bar *p*, and cause that bar, and consequently the plates *n*, to make a slight movement with the axis *o*, and reverse the position of the valves. *q*, *q*, are springs, carrying small pieces of metal which, by acting on the upper edges of the plates *n*, *n*, serve to keep the valves steady.

Motion is communicated to the apparatus, for registering the quantity of gas that has passed through the meter, by means of the bar *r*, jointed at one end to the plate *g*, and at the other end to a projection on the side of one of the valve-chambers; which bar *r*, carries a driver r^1, that turns a ratchet-wheel fixed on the spindle *s*, and thus causes a worm *t*, on the other end of the spindle, to give motion to a worm-wheel forming part of the train of wheels connected with the indices of the meter. Or, instead of the worm *t*, the patentees sometimes adopt the arrangement shewn at figs. 4, and 5, (fig. 4, being a front view, and fig. 5, a transverse section), which constitutes the second part of this invention. The peculiarity of the arrangement consists in this, that in whichever way the axis s^1, is turned, the wheel *w*, will be caused to revolve in the direction of the arrow: this is accomplished by means of two or more pieces *t*, of a peculiar shape, fixed on the axis s^1. It is not essential that the axis s^1, should make a complete revolution, as the arrangement will be found to act equally well if the axis s^1, only performs part of a revolution in one direction, and then performs part of a revolution in the opposite direction. This arrangement is stated to be equally applicable to wet gas-meters.

The patentees claim, as their invention, Firstly,—the mode of combining apparatus as above described. Secondly,—the mode of combining the apparatus *w*, *t*, and axis s^1, as described in respect to figs. 4, and 5.—[*Inrolled January*, 1849.]

To Charles Hancock, *of Grosvenor-place, Middlesex, Gent., for certain improvements in the preparation of gutta-percha, and in the application thereof, alone and in combination with other materials, to manufacturing purposes; which improvements are also applicable to other substances.*—[Sealed 10th February, 1847.]

This invention relates, firstly, to the methods and machinery employed for preparing gutta-percha for manufacturing purposes.

In the specifications of former letters patent, granted to the present patentee, he has directed that, for the purpose of cleansing crude gutta-percha, it should be first reduced into small pieces by means of saws, knives, choppers, and other suitable instruments; and he has also stated that the cutting of lumps of gutta-percha will be facilitated by first steeping them in hot water until they are softened. Now he has since found that by the employment of a machine of the description represented at figs. 1, and 2, Plate V., the crude gutta-percha may be cut with facility into very thin slices, without any previous steeping in hot water; and that the washing, purifying, and softening of the material are best effected by passing it, after it has been cut into slices, through the machinery represented at fig. 3. Fig. 1, is a front elevation of the slicing-machine, and fig. 2, a section on the line A, B, of fig. 1. *a*, is the framework; *b*, is a circular iron plate, formed with three radial slots, in which the knives b^1, are fixed, in a similar manner to the irons of an ordinary plane or spoke-shave; *c*, is a shaft, which carries the plate *b*, and is caused to rotate therewith by means of a steam-engine or other first mover; and *d*, is an inclined shoot, down which the lumps of crude gutta-percha are dropped against the knives of the plate *b*, by which they are cut into slices of a thickness corresponding to the degree of projection given to the knives: the slices are collected and put into a vessel filled with hot water, where they are left to soak until they become soft and pliable. Instead of a circular revolving-cutter, a vertical cutter, having a rising and falling motion, may be used. When the gutta-percha happens to be of a more than usually hard and intractable quality, knives of a curved form may be advantageously substituted for the straight knives shewn in the above machine.

Fig. 3, is a longitudinal vertical section of the apparatus through which the gutta-percha is passed after having been steeped, as aforesaid, in hot water until it has become soft

and pliable. *e*, is a large tank, divided into three compartments 1, 2, 3, of which 1, and 2, are filled with water to the height of the line C, D, and 3, is filled with water to the height of the line E, F. f^1, f^2, f^3, are three "breakers" or rollers, with serrated blades inserted in them in a direction parallel to their length, which breakers are mounted transversely over the tank *e*, and revolve clear of the water; and in front of each breaker there is a pair of fluted feeding-rollers *g*.—h^1, is a funnel-shaped shoot, through which the softened pieces of gutta-percha are passed to the feeding-rollers of the first breaker; h^2, is an inclined endless web, mounted upon two rollers, the front one of which is immersed in the water, and the other one is situated opposite the space between the feeding-rollers of the second breaker; and h^3, is a second inclined endless web, placed before the third breaker. *i*, is a "mincing" cylinder, with radial blades, which is mounted transversely over the compartment 3, of the tank, but at a lower elevation than the breakers, so that one-half of it shall always be immersed in the water in that compartment; and *j, j*, are edge-plates, so fixed that the blades of the cylinder *i*, shall, in revolving, come into such close parallelism with them, as to produce, by their approximate conjunction, a scissor-like action on any matters which may come in contact with them. The mincing-cylinder is provided, like the breakers, with an endless web h^4, and a pair of feeding-rollers *g*.—*k*, is a rotary agitator, which is wholly immersed in the water of the compartment 3; *l*, is a travelling endless web, which stretches in an inclined direction athwart the whole depth of the water in the compartment 3, and subdivides the compartment into two parts; *m, m*, are rollers, mounted in pairs, transversely over the after part of the compartment 3, at such an elevation that the lower rollers revolve under the water and the upper rollers just free of it; *n, n*, are tables or benches, placed between the pairs of rollers, for the purpose of supporting the gutta-percha in its passage from one to the other.

The action of this machinery is as follows:—The feeding-rollers *g*, the carrying-rollers of the endless webs h^2, h^3, h^4, and the rollers *m, m*, are all made to revolve in a forward direction; while the breakers, the mincing-cylinder, and the agitator *k*, are made to revolve in the opposite direction. The breakers and mincing-cylinder should revolve at the rate of from 600 to 800 revolutions per minute; but the feeding-rollers and endless webs need not move faster than about one-sixth of that rate. The first series of rollers *m, m*, should revolve at the rate of from 15 to 20 revolutions per minute;

and the others may be made to exert a drawing or stretching action on the materials passed between them, by causing one, two, or more of the last pairs in the series to revolve at a greater velocity than the preceding ones. As the crude gutta-percha is presented by the feeding-rollers *g*, to the action of the first breaker, it is broken into shreds or fragments, and considerable quantities of earthy and other extraneous matters are beaten out of and disengaged from it,—the whole falling into the water beneath, where different materials assort themselves according to their specific gravities: such pieces as consist of pure gutta-percha, or in which gutta-percha predominates, float on the surface of the water, while most of the other matters sink to the bottom. The web h^2, then draws towards it the floating gutta-percha, and carries it upwards to the second set of feeding-rollers *g*, which deliver it to the second breaker, in order that it may be further disentangled and purified. The gutta-percha is then subjected to the action of the third breaker; and it is next carried upwards by the endless web h^4, to the delivering-rollers *g*, which present it to the revolving cylinder *i*, by the blades whereof it is cut or minced into a multitude of very thin slices, which, as they fall into the water in the compartment 3, are thrown forward in the direction of the agitator *k*. As this agitator revolves in a direction opposite to that in which the floating mass of gutta-percha is moving, it forces the gutta-percha down into the water, and causes it to take a circuitous course towards the large endless web *l*; whereby it is washed free from any dirt which may have collected upon it in passing through the preceding operations. By the endless web *l*, the gutta-percha is next moved onwards to the series of rollers *m, m*; and from the last pair of the series the gutta-percha is raised by an endless travelling web *o*, to a pair of metal pressing and finishing-rollers *p, p*, which are set at a distance from one another equal to the thickness of the sheet or band into which it is desired that the gutta-percha should be compressed. After passing between the rollers p, p^1, the sheet or band is carried back over the top roller p^1, and over the wooden drum *q*, to the taking-up roller *r*. As the sheet or band is turning back over the roller p^1, a sheet of cloth, or any other material suitable for joining with it, may be led in, as shewn at *s*, and, by being passed in conjunction with it between the roller p^1, and the drum *q*, it will be firmly united to it. The water in all the compartments of the tank *e*, should be used cold. When the crude gutta-percha has a fetid smell, the patentee mixes with the water a

solution of common soda or chloride of lime, as directed in the specification of letters-patent granted to him Nov. 9, 1846. The whole of the improved machinery, above described, is also applicable to the cleansing, purifying, and otherwise preparing of bottle caoutchouc and of jintawan in its crude state.

This invention relates, secondly, to certain improvements on processes previously secured to the present patentee, and consisting in sulphuretting gutta-percha (since called metallo-thionising), and in applying these improvements to the sulphuretting of caoutchouc and jintawan.

In the last-mentioned specification, the patentee recommends that the sulphuretting of the gutta-percha should be effected by means of sulphurets, such as orpiment or liver of sulphur, in preference to sulphur itself; and he there states that though a portion of sulphur might be used in place of an equal portion of sulphuret, yet he considers the use of sulphur to be altogether objectionable, because of its offensive smell and tendency to effloresce. He has since ascertained that if a minute portion of sulphur be used along with a sulphuret, a better result is obtained from a combination of the two than from either substance alone: the proportions which he finds to be the best are, 6 parts of sulphuret of antimony, or hydro-sulphate of lime, or some analogous sulphuret, and 1 part of sulphur, to 48 parts of gutta-percha; when these materials have been mixed, the compound is to be put into a boiler and heated (under pressure) to a temperature of from 260° to 300° Fahr.; and it is to be left in this state for a period varying from half an hour to two hours, according to the thickness of the materials: by which time the gutta-percha becomes completely sulphuretted or metallo-thionised. The patentee applies precisely the same combination of materials (*i. e.* a sulphuret and a small quantity of sulphur) to the sulphuretting of caoutchouc and jintawan, and in the same way.

The third part of this invention consists in certain improved modes or means of effecting the combination of sulphur and sulphurets with gutta-percha, and also with caoutchouc and jintawan.

In the last-mentioned specification, the patentee directed that such combination should be effected while the gutta-percha, or caoutchouc, or jintawan, was passing through the masticating machine; but he now finds that it may be more readily and equally well accomplished by one or other of the four following modes:—The first mode consists in exposing

gutta-percha, caoutchouc, or jintawan, after it has been cleansed, purified, and reduced to a sheet state, to the combined action of steam of a high temperature and the vapours of orpiment (or other volatile sulphuret) and sulphur (mixed in the proportions above stated) in the apparatus represented, in vertical section, at fig. 4. *a*, is a metal chamber, into which the material to be sulphuretted is placed;—the chamber being provided with a steam-tight cover *b*, secured by screw-bolts, so that it may be removed when the material is to be introduced or taken out. *c*, is a steam-boiler, furnished with a safety-valve *d*, and connected by the pipe *e*, with a metal pot *f*. The pot *f*, receives the orpiment or other sulphuret and sulphur, which are introduced through an opening at the top, on the lid *g*, being raised; the pot is heated by means of a fire-place f^1, beneath; and it is connected by a pipe *h*, with the chamber *a*. *i*, is a safety-valve at the top of the chamber *a*; *j*, is a thermometer; and *k*, is a cock, by which the condensed water, that accumulates in the chamber *a*, is drawn off. The mode of operating is as follows:—A fire is first lighted under the boiler; and when the safety-valve indicates the approach to a temperature of 280° Fahr., a fire is lighted beneath the pot *f*. The cocks *l*, *m*, are then opened, and the steam thereby allowed to pass through the pipes *e*, *h*, and the upper part of the pot *f*, into the chamber *a*, containing the gutta-percha, caoutchouc, or jintawan, in order that the same may be thoroughly heated before being sulphuretted: after a short times, fumes of orpiment and sulphur begin to ascend and mingle with the steam. The admission of steam and vapours into the chamber *a*, is kept up for a period varying from half an hour to two hours, according to the thickness of the material operated upon; then the cock *m*, is closed, the fires are drawn or damped, and the safety-valve *i*, raised; and when the chamber *a*, is free from the vapours, the sulphuretted material is removed. Whilst the sulphuretting process is going on, the safety-valve *d*, is kept weighted a little heavier than the safety-valve *i*, in order that there may be a current in the direction of the chamber *a*.

The second mode consists in taking the gutta-percha, caoutchouc, or jintawan, in a perfectly dry state, and rubbing it over with the sulphuret and sulphur (combined in the proportions aforesaid, and reduced to a fine powder); and then placing the material in the chamber *a*, of the apparatus shewn at fig. 4, and subjecting it, for a period varying as aforesaid, to the action of steam of about 280° temperature, without using the volatilizing furnace f^1; or, instead of steaming the

material, the same may be placed, for the like period, in water, heated under pressure to 280°.

The third mode consists in taking the gutta-percha, caoutchouc, or jintawan, after it has been dry-rubbed, as last directed, and subjecting it to the whole of the first process, *i. e.*, exposing it both to steam of a high temperature and to the vapours of volatilized orpiment and sulphur.

The fourth mode consists in making a paste of the sulphuret and sulphur with the addition of a small quantity of gutta-percha or caoutchouc solution, brushing it over the material to be sulphuretted, and then subjecting the same to one of the three processes previously described.

This invention consists, fourthly, in the following means of improving the quality of gutta-percha, both in a sulphuretted and unsulphuretted state, and in the application of the same to caoutchouc and jintawan in the like sulphuretted and unsulphuretted states:—The patentee either exposes the material for a minute or two to the action of binoxide of nitrogen gas (obtained by the usual method of dissolving a metal, such as zinc, copper, or mercury, in nitric acid), or he immerses it in a boiling and concentrated solution of chloride of zinc for a period varying from one to five minutes, according to the strength of the solution; and, in either case, he afterwards washes the material with some alkaline solution, or with soft water. The material may be subjected to the action of the binoxide of nitrogen gas, either by putting it into the acid while the metal is in the course of being dissolved and the gas evolved, or by introducing it into a chamber in which the gas has been collected for the purpose. Gutta-percha, which has been thus treated (whether sulphuretted or unsulphuretted), becomes exceedingly smooth and of a lustre approaching to metallic; so also does common unsulphuretted caoutchouc, with the addition of being entirely freed from that stickiness peculiar to it; while sulphuretted caoutchouc acquires, under such treatment, all the downy softness of velvet.

The fifth part of the invention consists in the application of the means last described to the improvement of the quality of ordinary sulphurized or vulcanized caoutchouc, by subjecting it to the action of binoxide of nitrogen gas, or immersing it in chloride of zinc, and then washing it well: by this means the strong smell of sulphur is nearly if not completely removed.

The sixth part of the invention consists in producing a new compound of gutta-percha by mixing, in a masticating

machine, six parts thereof with one part of chloride of zinc; and in forming new compounds of caoutchouc and jintawan by a like proportional combination. All of these compounds admit of being afterwards sulphuretted or sulphurized.

The seventh part of the invention consists in an improved combination of materials for producing a porous or spongy gutta-percha, fit for stuffing or forming the seats of chairs, cushions, mattresses, saddles, horse-collars, railway carriage-buffers, and other like articles, similar to that described in the specification before alluded to; and in the application of the said improved combination of materials to the rendering of caoutchouc and jintawan similarly porous and spongy. The patentee takes 48 parts of gutta-percha, caoutchouc, or jintawan (moistened, when a very soft and light product is desired, with oil of turpentine, naphtha, bisulphuret of carbon, or other proper solvent), 6 parts of hydrosulphuret of lime, sulphuret of antimony, or any other analogous sulphuret, 10 parts of carbonate of ammonia, carbonate of lime, or other substance that is either volatile or capable of yielding a volatile product, and one part of sulphur; he mixes these materials together in a masticator, and then subjects them to a high degree of heat, observing the same conditions in respect thereof which are set forth in the specification before alluded to; except only that the heat may be pushed with advantage several degrees higher, say to from 260° to 300°.

The eighth part of this invention consists in the application of the various means of improving the quality of gutta-percha, described under the third and fourth heads of this specification, to the improvement of the quality of articles manufactured of ordinary gutta-percha; and in the application also of the same means to the improvement of manufactured articles of caoutchouc or jintawan, or of any compound or article of which gutta-percha, caoutchouc, or jintawan may form a part. The following are some of the articles made of gutta-percha and caoutchouc, which may be most improved in quality and appearance by these processes (whether applied to the material before it is made up or afterwards):—The waterproof fabrics, known by the name of double and single textures, boots, shoes, galoshes, gaiters, braces, belts, bands, bandages, trousers and other straps, capes, cushions, life-preservers, bottles, bags, tubes, hose, flasks, cases, sheaths, holsters, cartouch boxes, knapsacks, caps, helmets, hats, cups, bowls, and other vessels of capacity, hammer-cloths, gig-aprons, printer's blanketing, covers for rollers employed in

pressing and finishing soft goods, cotton spinning-rollers, backs of cards for carding wool, backs of brushes, washers, flute key-stops, piano hammers, bottle stoppers, capsules, cord, thread, string, rings, paper-holders, springs, trusses, &c.

The ninth part of the invention consists in producing, by the combination of gutta-percha, caoutchouc, and jintawan, with other materials, a fabric of a permanent lustre, resembling that of japanned goods; and in giving the like lustre to articles made of any of these materials in a sulphuretted state. The patentee takes the gutta-percha, caoutchouc, or jintawan, after it has been sulphuretted, and either before or after it has been made into an article of use, and brushes it over with a solution of resin in boiling oil; he then places it for from two to five hours in a chamber heated to from 75° to 100° Fahr.; and afterwards polishes it by the means and in the manner usually adopted by japanners. In some instances coloring matters are mixed with the japanning materials, which are to be applied by blocks, cylinders, or rollers, in the usual way of floor-cloth printing.

Lastly, the invention consists in an improved machine for cutting gutta-percha into strips or ribands, and manufacturing it into thread or cord of any required shape. Fig. 5, is a front elevation of the machine. It consists of two grooved rollers, of iron or steel, mounted in a suitable framework. The grooves of each roller are semicircular, and the projecting divisions between the grooves are made with knife-edges, so as to divide readily any sheet or mass of gutta-percha which may be presented to them. The under roller is flanged at both ends, and the upper roller is made to fit inside of these flanges, in order to keep the cutting edges from shifting or being damaged. To cut thin sheets of gutta-percha with this machine into strips or ribands, the material is passed through it in a cold state, and only the cutting edges are brought into operation. To make round thread or cord by means of it, either a sheet of gutta-percha, of a thickness equal to the diameter of the holes formed by the grooves, and at a temperature of 200° Fahr. (produced by supplying it from a feeding-chamber, heated to that degree) is passed through the machine, and the threads or cords are received in a tank of cold water, from which they are led away to and wound on reels or drums; or the gutta-percha is employed in a plastic state, and passed under a gauge before it enters the machine. If it should be desired to produce cord of a semicircular form in the transverse section, a plain roller is substituted for the lower grooved roller; or should cord of

square, triangular, hexagonal, or any other angular form, be required, the two rollers shewn at fig. 5, are removed, and two others, grooved in such manner as to produce the desired figure, are substituted.

The patentee claims, Firstly,—the preparation of gutta-percha for manufacturing purposes by means of the machines or machinery represented at figs. 1, 2, and 3: that is to say, in so far as regards the peculiar adaptation and order of sequence of the parts of the said machinery and general arrangement and combination thereof; but without laying claim to any of the parts of which the said machine or machinery consists, singly and separately considered. Secondly,—the new combination of materials for sulphuretting or metallo-thionising gutta-percha, specified under the second head of this specification. Thirdly,—the several new methods of combining sulphur and sulphurets with gutta-percha, described under the third head of this specification, and the apparatus represented at fig. 4, in so far as it forms an adjunct to such methods. Fourthly,—the employment of binoxide of nitrogen and chloride of zinc for the purpose of improving the quality of gutta-percha, as before described. Fifthly,—the application of binoxide of nitrogen and chloride of zinc to the improvement of the ordinary sulphurized or vulcanized caoutchouc. Sixthly,—the new compounds of gutta-percha, caoutchouc, and jintawan, described under the sixth head of this specification. Seventhly,—the improved combination of materials for producing porous or spongy gutta-percha, caoutchouc, and jintawan, described under the seventh head. Eighthly,—the application of the various processes described under the third and fourth heads of this specification to the improvement of articles of gutta-percha in a manufactured state, after they have been so manufactured. Ninthly,—the mode of giving to sulphuretted or metallo-thionised gutta-percha a japan-like lustre, as before described, whether applied before or after the making up of the same into articles of use. Tenthly,—the improved machine or apparatus for cutting gutta-percha into strips or ribands, and manufacturing it into thread and cord, before described. Eleventhly,—the application of the whole of the said improvements to caoutchouc and jintawan (in so far as such application has not been already claimed) to the extent before pointed out and explained.—[*Inrolled August*, 1847.]

To Alexander Robertson Arrott, *manager of the Union Plate Glass Works, St. Helen's, in the county of Lancaster, for improvements in manufacturing common salt.*—[Sealed 5th January, 1848.]

This invention consists, firstly, in an improved method of manufacturing common salt from brine, by mixing muriate of lime (chloride of calcium) or muriate of magnesia (chloride of magnesium) with such brine, and thereby producing such a solution, containing common salt, as may be concentrated to a considerable extent without a deposition of salt taking place; and by transferring such solution, containing common salt, when so concentrated, into a vessel wherein common salt becomes deposited by cooling such concentrated solution. By the use of muriate of lime or muriate of magnesia, brine may be concentrated in closed boilers without the deposition of salt taking place, and thus great facilities are obtained in collecting (for the purpose of applying to heating purposes) the steam evolved from the solution during such concentrating process. The invention consists, secondly, in manufacturing common salt by the use of a heated solution of muriate of lime, or of muriate of magnesia, for the purpose of dissolving common salt from rock salt, and thereby producing a solution from which common salt is obtained by cooling such solution.

In Plate V., the apparatus used by the inventor for manufacturing common salt from brine is shewn. Fig. 1, being a plan view; fig. 2, a vertical longitudinal section of such apparatus; fig. 3, a vertical section, on an enlarged scale, of that part of the apparatus which is hereinafter called a condenser; and fig. 4, a plan view of the upper part of this condenser, with its cover removed. A, is a closed boiler, similar to those used for generating steam for steam-engines; B, B*, are two open vessels, constructed of wood, and intended to receive the deposit of salt; and C, is a vessel termed the condenser. This vessel C, consists of a steam-tight casing, marked *b*, *b*, having two tube-plates *c*, *c*, affixed thereto, into which a number of open tubes *d*, *d*, are fitted steam-tight. These tubes communicate at one end with a chamber forming part of the condenser C, and marked *p*, and at the other end with a chamber *q*. *f*, is a tube proceeding through the middle of the condenser C, and communicating at its upper end with the open vessel B*, and at its lower end with the chamber *q*;—*g*, is a tube connecting the chamber *p*, with the boiler A; and *h*, is a tube for conducting steam from the boiler A, into the condenser C, between the tube-plates *c*, *c*,

and among the tubes *a, a,* which are filled with brine. The tube *h,* should be of a size sufficient to take off the whole steam generated in the boiler A, without causing a sensible pressure therein, or a pressure not exceeding two inches of water. *m,* is a tube provided for the escape of condensed steam from the condenser C; and *n,* is a tube communicating from the vessel K, to the chamber *q,* and having a tap *i,* for regulating the supply of brine to the apparatus. The brine, before it enters the chamber *q,* should be as warm as the liquor is when it leaves the vessel B*, by the pipe *f;* and if the heat from the condensed steam is not sufficient to do this, the brine, before entering the chamber *q,* should pass through a small heating apparatus, similar to the condenser C, or of any convenient form, having a branch from the steam-pipe *h.* The hot water flowing from the condenser C, is caused to pass, in pipes, through the vessel K, and thereby to transfer heat to the brine. *e,* is a tube connecting the boiler A, with the open vessel B; and *d,* is a tube connecting the open vessel B, with the other open vessel B*.

The manufacturing of common salt by means of this apparatus is commenced by filling it up to the dotted line *r, s,* with brine, to which muriate of lime or muriate of magnesia, in the proportion hereinafter described, has previously been added. Fire is then applied to the boiler A, so as to cause the solution contained therein to boil; when steam will pass through the tube *h,* into the condenser C, and, coming into contact with the tubes *a, a,* will transfer heat to the solution contained in these tubes, and thereby cause a flow of the solution from the vessel B*, through the said tubes and the chamber *p,* into the boiler A; and, consequently, the heated solution will flow from the boiler A, into the open vessel B, and from thence to the open vessel B*, whereby a circulation of the solution through the whole apparatus is effected. As the solution contained in the boiler A, evolves its water in the form of steam, this solution becomes concentrated, so as to contain a larger proportionate quantity of common salt; and such concentrated solution being transferred by circulation into the open vessels B, and B*, a further evaporation of water takes place, occasioning a reduction of the temperature of the concentrated solution, and a consequent deposition of common salt in the open vessels B, and B*, without any deposition of common salt in the boiler A. Brine is supplied to the apparatus through the vessel K, in such quantity as may be equivalent to the quantity of common salt manufactured; and it will be perceived that this supply of brine, together with the

cooled solution flowing from the open vessel B*, passing through the tubes *a*, *a*, of the condenser C, will absorb heat from the steam passing through the said condenser.

When working, the patentee prefers to have such a proportion of muriate of lime or muriate of magnesia with the brine in his apparatus, as will cause the solution, as it passes from the condenser C, to the boiler A, to have a specific gravity of 1230, at the temperature of 90° Fahr. (water as 1000 at 60°); and at this strength the liquor is kept during the process. If a sample of liquor taken from the tube has a specific gravity at 90° of more than 1230, more brine is admitted into the apparatus; but if less than this number, the supply of brine is diminished accordingly, provided this can be done without reducing too much the whole quantity of liquor in the apparatus; but if it cannot be done without too much reducing the quantity of liquor, the specific gravity must be increased by adding a fresh portion of muriate of lime or muriate of magnesia.

Fig. 5, represents, in sectional elevation, the apparatus which the inventor employs for obtaining common salt from rock salt. A, is a vessel for heating the solution (its construction and setting being similar to that of a common steam-boiler); B, is one of two open vessels (similar to those in the before-described apparatus), in which the salt is to be deposited from the solution, after being heated in the vessel A; C, is a circular wooden vessel, close at the bottom and open at the top, and having a false or perforated bottom *a*, fixed about a foot from the true bottom; and *b*, is a tube for connecting that vessel B, which is nearest to the vessel C, with the chamber *g*, formed by the false and true bottom of that vessel C. A communication is made by a tube *d*, between the two open vessels B; and a tube *e*, at the further end of the heating vessel A, connects that vessel with the more distant of the open vessels B.

The manufacture of common salt is commenced with this apparatus by filling the vessel C, with rock salt, in small pieces;—the salt resting on the false bottom *a*, and leaving the chamber *g*, free. A tube *a**, which forms a connection between the vessels A, and C, is closed, together with the tube *e*, by means of a plug; and the heating vessel A, is filled with a solution of muriate of lime, or muriate of magnesia, of such a strength that, when saturated with common salt, and at the temperature of 90°, it will have a specific gravity of 1230. The open vessels B, and the vessel C, are filled with a similar solution, saturated with common salt, and fire is applied under the heating vessel A. As soon as the liquor has at-

tained the temperature of 224°, the plugs from the closed tubes are removed, and a circulation will then take place through the apparatus;—the hot liquor from the vessel A, which should, during the working, be always maintained at the above temperature, will flow into the vessel C, and descend into the chamber *g*, and having become charged with common salt, by passing through the rock salt contained in the vessel C, from the chamber *g*, of this vessel, it will flow up the tube *b*, into the open vessel B, connected therewith; from thence, by the tube *d*, it will flow into the other vessel B, and thence return to the heating vessel A, by the tube *e*: while flowing through the open vessels B, the liquor will have become reduced in temperature and have deposited in these vessels the common salt which it had dissolved from the rock salt in the vessel C; and a portion of the water of the solution being carried off by evaporation in the open vessels B, a quantity of water or brine, equivalent to this evaporation, is then added to the liquor in the heating vessel by the tube *f*. A liquor, of the strength before mentioned, is used by preference; but a great variation may be made in the strength without materially affecting the process, and the supply of water or brine, to make up the loss by evaporation, may be regulated with sufficient accuracy by means of a float in the heating vessel, so as to keep the liquor at the same level.

In order to obtain the different qualities of salt, by either of the above processes, the open vessels B, may be divided into different sections by means of divisions *j*, *j*, *j*, *j*, placed across them; and these divisions should have their upper edge above the surface of the liquor, and their lower edge within a few inches of the bottom of the vessel: the finest grained salt will be deposited in the section where the solution is hottest, that is, in the section nearest to the place where the liquor enters the open vessel; and the coarsest grained salt will be made in the section nearest to the exit from the open vessel, or where the solution is coldest;—the number and size of these sections will vary with the qualities of grain required.

The salt, as drawn from the open vessels B, B*, may, if required, be freed, in a great measure, from the small quantity of muriate of lime which adheres to it, by placing the salt where the solution can drain from it, and pouring fresh brine upon the salt, and thus washing out the muriate of lime.

The patentee, in concluding his specification, states that he does not claim the manufacturing of common salt from solu-

tions containing naturally some proportion of muriate of lime, or muriate of magnesia, unless these solutions are concentrated and operated upon, in order to so far increase the proportion of muriate of lime or muriate of magnesia as to admit of the said solution (containing common salt in conjunction with muriate of lime or muriate of magnesia) being concentrated, to a considerable extent, in a covered or close boiler, without allowing the common salt to become deposited therefrom in the boiler; but which common salt may be obtained from the concentrated solution by allowing the same to cool in open vessels.

He claims, Firstly,—the use, in the manufacture of common salt, of such a proportion of muriate of lime (chloride of calcium), or muriate of magnesia (chloride of magnesium), in mixture with brine, as will provide for the solution being concentrated, to a considerable extent, in a closed boiler or heating vessel, without depositing common salt therein; and also the concentration of such solutions in a close or covered boiler, and the production of common salt therefrom by transferring such concentrated solution from such closed boiler or heating vessel to proper open vessels or pans, and there allowing the concentrated solution to cool, and thereby deposit the common salt. Secondly,—the use of heated solutions of muriate of lime (chloride of calcium), or muriate of magnesia (chloride of magnesium), or solutions containing these or either of these matters for dissolving common salt from rock salt, and obtaining common salt by cooling the solutions thereby obtained.—[*Inrolled July,* 1848.]

To George Fergusson Wilson, *of Belmont, Vauxhall, in the county of Surrey, gent., for improvements in treating and manufacturing certain fatty or oily matters, and in the manufacture of candles and night-lights.*—[Sealed 25th January, 1848.]

The first improvement in treating and manufacturing fatty or oily matters relates to an invention for which the present patentee obtained a patent in March, 1847;* which consisted in the manufacture and use, for the purposes of light, of an oil composed of oleic acid mixed with oil not in the acid state. The present improvement consists in manufacturing similar compound oils by certain applications of the liquid part of

* For description of this invention see Vol. XXXI. of our present Series, p. 204.

palm oil in combination with or partial substitution for the materials mentioned in the specification of the above-named patent.

The liquid palm oil may be used in an unbleached state as a cheap substitute for the lard oil or castor oil mentioned in the former specification; and as the process of bleaching by exposure to light and air more or less acidifies the palm oil subjected thereto, liquid palm oil, bleached by this process, or by any other producing similar effects, may be used in place of the oleic acid. When unbleached liquid palm oil is used, the mode of manufacture is the same as that described in the above specification; but the proportion of non-acid oil is increased: the patentee prefers to use three parts of unbleached palm oil to one part of oleic acid. When bleached palm oil is used, as it is less purely acid than oleic acid otherwise obtained, he prefers to employ it in larger relative proportions. The patentee remarks that the unbleached palm oil may be only substituted in part for the lard oil or castor oil, and the bleached palm oil only in part for the oleic acid, so as to retain the necessary relative proportions of acid oil and non-acid oil in the whole mixture. The expressed fluid oil of palm in the non-acid state and like fluid oil in the acid state may be combined and produce a composite oil according to this invention; but the patentee says he believes that the best results will generally be obtained by using different oils.

The second improvement relates to the preparation of Southern oil for lubricating machinery, in order to remove its tendency to become gummy, which renders it unsuitable for lubricating purposes; this defect, the patentee has found, may be removed in a great measure by mixing the Southern oil with liquid cocoa-nut oil, or with liquid lard oil.

The patentee prefers to use one part of Southern oil to one part of liquid cocoa-nut oil, or liquid lard oil; and, before mixing, he purifies the several oils by means of alkali. For this purpose he uses a solution made by boiling 1000 lbs. of American potash in 250 gallons of water, in an iron vessel, by means of free steam, until the potash is dissolved; after which a sufficient quantity of water is added to supply the loss caused by evaporation; then the solution is allowed to settle for 12 hours; and at the expiration of this time the clear solution is drawn off from the impurities. The quantity of solution thus produced is sufficient for purifying 10 tons of Southern oil, or liquid cocoa-nut oil, or lard oil. The oil having been put into a suitable iron vessel, the solution is stirred slowly in, and the agitation is continued for two hours

afterwards; then the mixture is left to repose for 24 hours; at the end of this time the oil is drawn off from the dregs and boiled, by free steam, in a wooden vessel, with half its bulk of water; it is then left to repose for 12 hours; after which the water is drawn off, an equal quantity of fresh water added, and the boiling is repeated.

The third part of this invention relates to obtaining a fatty matter from "scutch," which is a refuse material produced in the manufacture of glue.

In the specification of a patent granted to A. M'Dougall on January 14, 1847*, a process for effecting this object is described, in which muriatic acid is used to form muriate of lime, by combining with the lime contained in the scutch, and thus facilitating the disengagement of certain other component parts thereof. In this process the muriatic acid is used in the liquid state; but the present patentee has discovered that a considerable saving may be effected by employing the acid in a gaseous form. He introduces the muriatic acid gas, as produced by the decomposition of common salt, into a close vessel containing the scutch, and so causes the muriatic acid gas to condense amongst the scutch;—thereby dispensing with the necessity of a previous condensation of the gas. The process of obtaining fat from scutch by such means may be still further improved by the admission of small jets of water into a pipe that passes out from the vessel in which the operation is performed, in order to condense the gases and vapours which would otherwise escape into the atmosphere and cause a nuisance.

The last part of the invention relates to the manufacture of candles and night lights, and consists in combining palm oil, which has been bleached by exposure to the atmosphere, with distilled fatty acids, with or without other fats. The patentee says he has found that, by combining one part of crude cocoa-nut oil, one part of cold-pressed atmospherically-bleached palm oil, and one part of unpressed palm oil, acidified by sulphuric acid and distilled, as described in the specification of a patent granted to George Gwynne and George Fergusson Wilson, Dec. 28, 1843, an excellent product is obtained; but the quantities may be varied; and other distilled fatty acids may be used, either pressed or unpressed.

The patentee claims, Firstly,—employing expressed liquid palm oil, bleached or unbleached, in the manufacture of an oil for burning, composed partly of oil in an acid state and

* For description of this invention see Vol. XXXI. of the present Series, p. 91.

partly of oil not in an acid state. Secondly,—the manufacture of oil for lubricating machinery, by combining expressed liquid cocoa-nut oil, and also the expressed liquid lard oil, with Southern oil. Thirdly,—the application of muriatic acid in a gaseous form in the preparation of fatty matters from scutch; and also in the application of water for the purpose of condensing gases and vapours in the preparation of fatty matters from scutch. Fourthly,—the manufacture of candles and night-lights of atmospherically-bleached palm oil, combined with distilled fatty acids.—[*Inrolled July*, 1848.]

To Moses Haym Picciotto, *of Finsbury-square, London, for a method or methods of purifying and decolorizing certain gums.*—[Sealed 17th August, 1848.]

This invention consists in two processes for purifying and decolorizing all varieties of gum-arabic, including that brought from Senegal.

The first process is as follows:—The patentee prepares a rather strong solution of sulphurous acid gas, and purifies the gas, previously to using it, by passing it through water, contained in a suitable apparatus: the purified acid solution of the gas must be protected as much as possible from the contact of atmospheric air. Into the solution a quantity of gum-arabic, in the state in which it is imported, or in powder, is introduced, in the proportion of one part, by weight, of gum, to from six to twelve parts of the solution: when the gum is dissolved, it will be found that the greater portion of its coloring matter has been destroyed, or has chemically combined with the sulphurous acid, forming a colorless compound. The sulphurous acid may be brought into contact with the gum by other methods than that just described; for instance, if a current of the purified gas be introduced into a solution of the gum, it will be readily absorbed; or the sulphurous acid gas may be introduced into a close receiver, surrounded with some refrigerating substance, wherein, by the action of cold and the pressure of the gas itself, it will be condensed into a liquid form; and in this form may be mixed with a solution of gum.

In order to separate the acid, or the acid combined with coloring matter, from the solution of gum, various methods may be adopted; but the patentee prefers the following:—He applies heat for a short time to the close vessel containing the mixture—during which time the portion of gas evolved

may pass through a tube into another receiver, containing water, and thus be recovered for another operation—and then he allows the hot mixture to run off, in small portions, into a larger and open vessel, containing (rather in excess) some salifiable base, which, in its combination with sulphurous acid, will form an insoluble salt. Various substances may be used for this purpose; but the patentee prefers carbonate of baryta, as sulphite of baryta is an absolutely insoluble salt as well as the sulphate. The combination is aided by stirring; and when the whole of the disengaged carbonic acid gas has been driven off, and the solution becomes neutral, the vessel is covered, and the solution allowed to rest for some hours, so that the coarser parts of the solid matters may be deposited. The neutralization of the acid may also be effected without previously heating the liquid; but then the patentee recommends that it should be heated after the combination has taken place, in order to drive off all carbonic acid, which, if allowed to remain in the solution, would dissolve a small portion of undecomposed carbonate of baryta. The solution is now to be filtered, in order to separate the insoluble sulphite of baryta and other insoluble impurities therefrom: the patentee prefers to effect the filtration through a thin layer of pure gelatinous hydrate of alumina (which may be obtained by the decomposition of sulphate of alumina) laid on cloth; or the same object may be effected by forcing the pure liquid through unglazed earthen or stone-ware. After the solution has been filtered it will be found that all ligneous fibre, sand, and earthy matters, and all particles of insoluble gum, have been separated from the solution, and deposited in the vessels used and on the filter with the sulphite of baryta; and very little color will remain in the filtered solution; but when a very white gum is required, the process of acidulation must be repeated. By evaporating the filtered solution, a colorless, tasteless, and pure gum is obtained, the natural properties of which have not been altered in the least degree.

The sulphurous acid gas may be separated from the solution of gum, without neutralizing it by means of a base, by boiling the mixture in a close air-tight vessel, and conducting the gas, which is driven off, into a receiver containing water. If required, the decolorizing process may be repeated, by introducing a current of pure sulphurous acid gas into the vessel containing the solution, and then separating it by ebullition. When the solution has become cool, it will be found that all the impurities originally united with the gum

are deposited at the bottom of the vessel, and the pure solution may be drawn off; or the whole contents of the vessel may be emptied into cloth bags, and the solution allowed to filter through the same.

The second process for purifying gum-arabic is as follows:—The gum is dissolved in cold or hot water, in the proportion of one part, by weight, of gum, to from six to fifteen parts of water, and the solution is filtered through cloth; then a quantity of pure gelatinous hydrate of alumina, or hydrate of alumina containing a small portion of fine pipe-clay or other earthy and insoluble substance, is thoroughly mixed with the solution, with or without heat, so as to form a homogeneous compound of about the consistence of thin paste; and this being now filtered through cloth, the pure solution of gum that percolates through will be found greatly decolorized. Instead of making the mixture just described, the simple solution of gum may be passed through a bed of alumina, or alumina and other substances, and the decolorization will be effected equally well; but then the filtration must be much slower. The filtered solution must be again operated upon with a fresh portion of hydrate of alumina (alone or with other substances), if a perfectly white gum is required; and sometimes a second repetition of the process may be necessary; but as the second and third portions of alumina, after being used, contain very little coloring matter, they may serve again for the first decolorization of another portion of gum. When the hydrate of alumina (alone or with the other substances) is highly charged with coloring matter, it is washed with hot water on the filter, to separate the adhering gum from it; after which, the alumina is washed with a cold aqueous solution of chlorine, or with a limpid solution of chloride of lime; and then it is filtered and again washed repeatedly with hot water: its original whiteness and purity are thus restored, as well as its chemical affinity for coloring matter.

The patentee claims, Firstly,—the decoloration of all varieties of gum-arabic and Senegal by sulphurous acid, by whatever method the said acid be generated, in whatever manner the said acid be brought into contact with the gum, and by whatever means the said acid be neutralized or separated therefrom. Secondly,—the decoloration of all varieties of gum-arabic and Senegal by hydrate of alumina, alone or used with other substances. Thirdly,—the purification of gum-arabic and Senegal in solution, as combined with the process

of decoloration, by the means above described. Fourthly,—the decoloration and recovery of the hydrate of alumina, after having been charged with coloring matter, as above described.—[*Inrolled February*, 1849.]

To James Roose, *of Darlaston, in the county of Stafford, tube manufacturer, and* William Haden Richardson, *of the same place, tube manufacturer, for improvements in the manufacture of tubing.*—[Sealed 15th June, 1848.]

This invention consists in the manufacture of tubes of copper, brass, or other alloys of metal without seam or joint, by casting the metal into short thick tubes, and passing the same, upon a mandril, through a pair or more of grooved rollers, so as to roll the tubes to the length and diameter required: by this process the density of the metal will be increased, and the tubes rendered stronger and more durable than those made by the methods heretofore in use.

The patentees first cast short thick tubes, containing sufficient metal to form a tube of the required length, and having about the same internal diameter as the tube to be produced: these they clean both internally and externally, and then rub the inside thereof with some fatty substance, and remove the tubes to the rolling-machine, by which they are to be elongated. This rolling-machine is represented, in vertical section, at fig. 1: it consists of a pair or more of grooved rollers, similar to those used for rolling bars or rods of iron, with the addition of a pair of grooved rollers *a*, *a*, at the front of the rolls, and a grooved roller *b*, at the back, which serve to guide the tube in its passage between the rolls. The tube is placed upon a steel mandril, and passed through the several grooves of the rolls until it is reduced to the desired size,—being annealed between the successive operations of rolling to prevent it from splitting or cracking. In consequence of the very great pressure to which the tube is subjected, with the mandril inside, whilst passing through the rolls, the tube will

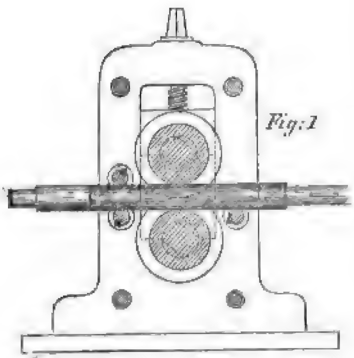
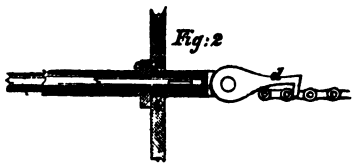


Fig: 1

remain firmly on the mandril; and, in order to remove it, the tube, with the mandril inside, is conveyed to a draw-bench, where the end of the mandril is fixed in the socket of the hook *d*, (shewn at fig. 2,) by passing a key or cotter through a slot in the end of the mandril, and through corresponding slots in the socket; this hook is connected with the endless chain (only a part of which is represented), and as the end of the tube butts against the die or stop *c*, the mandril will be withdrawn therefrom on the chain being put in motion. The patentees state, that the making a slot in the mandril, and affixing the end by a key or cotter, as shewn, is new, as a means of connecting the mandril with the chain or other moving instrument of a draw-bench.—[*Inrolled December*, 1848.]



To James Henderson, *of Surrey Canal Dock, millwright, for improvements in machinery for cleansing and polishing rice, pearl barley, and other grain and seed.*—[Sealed 14th August, 1848.]

This invention consists in coating with emery the surfaces used for cleaning and polishing rice, pearl barley, and other grain or seed requiring like processes.

The patentee states that the shape or arrangement of the rubbing surfaces, which are to act on the grain or seed, may be varied; but he prefers to construct the apparatus in the following manner:—He makes a cylinder, about two feet six inches in diameter, and two feet eight inches long, with a frame of iron, covered with wood; he clothes the ends and periphery with canvass, which he strains tightly and fastens by means of tacks; and he then covers the canvass with emery (by preference, of that degree of coarseness known as No. 1), causing it to adhere by means of glue. Previous to applying the emery it should be heated to about the temperature of the glue. The cylinder, thus prepared, is intended to rotate within a cylinder, formed of wire cloth (of about fourteen meshes to the inch), and closed at the ends; longitudinal bars being provided at intervals to give strength to the cylinder. The axis of the emery cylinder extends through the ends of the wire-cloth cylinder (there being washers or stuffing-boxes to prevent the grain or seed from passing through the open-

ings made for the axis); and this last cylinder should be made of such size as to leave a space of about an inch and a half between it and the emery cylinder at all parts. The wire-cloth cylinder should be stationary, and slightly inclined, so that the emery cylinder, and its axis, will also be slightly inclined; at the upper end of the wire-cloth cylinder there is to be a hopper for introducing the grain or seed; and at the other end there is to be an opening, regulated by a slide, at which the finished grain or seed can run out of the machine. The emery cylinder is to revolve at a speed of about two hundred revolutions per minute.

The patentee claims, as his invention, the coating of the surfaces used for cleaning and polishing rice, pearl barley, and other grain or seed, with emery.—[*Inrolled February,* 1849.]

To Edwin Thomas Truman, *of No.* 40, *Haymarket, in the county of Middlesex, dentist, for an improved method or methods of constructing and fixing artificial teeth and gums, and of supplying deficiences in the mouth.*—[Sealed 15th August, 1848.]

This invention consists, firstly, in the employment of gutta-percha for constructing gums to receive artificial teeth, and for making good other deficiences of the mouth in connection therewith; and secondly, in the application of electro-gilding in the manufacture of artificial teeth and gums, as a coating to soft materials.

It is usual to obtain a cast, in wax, of the mouth in its imperfect state, in order to ascertain what portions are to be made up by artificial teeth and gums; and from such cast a plaster model is obtained. The patentee makes a plaster model, and hardens the same, in the usual manner, with resin, &c.; and then he constructs a metal frame (by preference of gold, either in the form of wire or otherwise), corresponding in form with the artificial gum intended to be made, but of a smaller size. The teeth having been prepared of the proper length and color, the patentee solders pins to receive them upon the metal frame, in the same manner as if he were about to place them on a gold plate of the usual make; but it is not necessary to fit them to the frame, as the gutta-percha, with which the frame is subsequently covered, will form sockets around and under them to retain them in the same manner as teeth are naturally articulated in the jaw. The patentee takes gutta-percha (which has been

brought to a plastic state by the application of heat) and covers the whole of the frame therewith, excepting the pins; then he places it on the plaster model (previously wetted with cold water) in such manner as to bring the teeth, when placed on their respective pins, into the proper places to supply the deficiences; and he moulds the gutta-percha into the proper form, "to replace all the lost structures," without altering the surface that touches the model, by means of hot water or heated instruments. In order to make up for any imperfections in the plaster model, he subsequently warms the gutta-percha, places the same in the mouth, and presses it into position (by which it will become perfectly adapted to the mouth); he then removes the same from the mouth, and takes the teeth off the pins, leaving the sockets in the gutta-percha empty; after this he coats the pins with wax or other suitable material which will prevent a deposit of metal from taking place thereon when the gutta-percha is subjected to the process of electro-gilding; and then, by means of such process, he gives a coating of gold to the sockets and to the inner and outer surfaces of the gutta-percha, but not to the surface thereof that will be in contact with the person's gums: such is the peculiar property of the gutta-percha that it may be made to fit accurately the cavities and imperfections of the mouth; and artificial teeth so applied will not require any other fastening than what results from a good fit. The teeth are fixed on the pins and in the sockets by means of cement, as heretofore. It is not essential that the gutta-percha should be coated with gold; and although gutta-percha alone is mentioned in the above description, it may be combined with color or other matters.

The second part of the invention is carried into effect by manufacturing hard wax, or other matter that may be easily moulded, into the desired form, and coating the same with gold by the process of electro-gilding: by this means substances are rendered available for the purposes of this invention which could not otherwise be used.

The patentee says, he is aware that gutta-percha has been before employed for temporarily filling up a space in the mouth, caused by removing a tooth or teeth, and the same has been allowed to remain till artificial teeth, for filling such spaces, have been prepared; and he has been informed that gutta-percha has been used for making good some defects in the mouth, but not in connection with artificial teeth and gums; and he mentions these particulars in order that it may be understood that he makes no claim to such use of gutta-

percha. What he claims is, Firstly,—the manufacturing of artificial teeth and gums, and making good other defects of the mouth in connection therewith, by employing gutta-percha; and also coating the surfaces thereof with metal. Secondly,—he claims the application of electro-gilding in the manufacture of artificial teeth and gums as a coating to soft materials, as above explained.—[*Inrolled February*, 1849.]

Scientific Notices.

ON PATENT LAW REFORM.

ARTICLE II.

In discussing, in our last number, the subject of patent law reform, we raised for consideration two points which appeared to demand attention alike from the advocates for an amelioration of the present patent laws, and from those who go for a sweeping measure. These were, 1st, the propriety of acknowledging the indefeasible right of the inventor to the benefit arising from his own ingenuity and skill; and, 2nd, the policy of diminishing the cost of patents. In advancing the first proposition, we contented ourselves with shewing the advantages which would accrue to the inventor from a public acknowledgment of what we conceived to be his natural right—leaving the reasonableness of his demand to be supported by the common feeling of justice which presides over every well-regulated mind; but for the maintenance of the second proposition, we attempted—by comparing the number of patents applied for with those actually sealed, and shewing the probable per-centage that was stopped for want of pecuniary means—to adduce a positive proof of the injustice which the inventive public labored under from the excessive cost of patents. We now propose to further pursue our inquiry into the effect of high-priced patents upon the inventive and manufacturing interests, in order to ascertain whether, in addition to those evils before mentioned, others are not created, of a magnitude sufficient to balance the good which, according to the upholders of high prices, results from the oppression of the laborious inventor—whether the inconveniences which high-priced protection engenders are not a complete set-off to the benefits said to arise from the heavy tax which restrains the flood of invention so frightful in imagination to the opponents of cheap patents. Our next object will be to inquire into the working of the present system of granting

patents; still keeping in view, as much as may be, those points which are essential to the proper working not only of the present system, but of any efficient system of patent law which may hereafter be devised;—our desire being that these papers shall form a basis of reliable information to be hereafter referred to by such parties as may take an interest in furthering any legislative measures for patent law reform.

Next in order to the total prohibition of protection under which a large number of inventors labor, from the excessive nature of the tax on patents, we think the incentive to cram a number of inventions into one patent must rank as an evil resulting from the same source; for when the expenses of a patent are at last determined on, the patentee is naturally desirous of anticipating the necessity for his having to expend a similar sum for after improvements; he therefore taxes his ingenuity to such an extent that frequently crude and unsatisfactory ideas are started and embodied in his specification, with the hope of pre-occupying ground which he is in no position to maintain,—and which he would not so prematurely seek to occupy, if protection could be readily obtained at a reasonable rate. In order to enable the reader, who is unacquainted with the mode of granting patents, to judge of the extent of this evil, we should premise that when an inventor petitions for a patent, he recites in his petition the *title* or object of the invention; this being referred to the Attorney-General he reports thereon (knowing only the nature of the invention as set forth in the title) that it is expedient to grant a patent to the petitioner; and in due course the patent is granted. After the sealing of the patent, six months are allowed for *perfecting* the invention; and within this period the specification, setting forth the nature and advantages of the invention, must be enrolled. Now, when applications for patents are unopposed, or, to state it more distinctly, when the attention of the Attorney-General is not, by means of an opposition, specially called to the nature of the invention which is sought to be protected, there is nothing (but the words of the title of the patent) to limit the patentee in availing himself of every novel improvement which may come to his knowledge, and inserting them in his specification. A deposit-paper, which of late has been required in cases of opposed applications, has, in part, remedied this; but as the proportion of oppositions to the whole number of applications for patents is (as stated at page 48) as 3 to 10, by far the greater number of patentees have the power to amplify their inventions as far as their ingenuity will allow.

This facility, it may well be supposed, patentees have not altogether neglected; and as the only difficulty in the way of including a large assortment of inventions in one specification is the wording of the title, the ability of constructing titles, which would mean a great deal or very little, as circumstances might require, has been highly prized, and is in constant requisition.

The cupidity which the present system of granting patents has created among inventors, must not all be placed to the score of the excessive cost of patents; for if the tax were reduced, and no further alteration were made, the desire of superseding others, by gaining a prior date of protection, would be a sufficient stimulus with many to pursue the present course. With the majority of inventors, however, we are certain that an increased facility of obtaining protection would be a strong inducement to keep back unmatured schemes, when they were about to specify; instead of availing themselves of that opportunity to include a variety of matters foreign to the invention for which the patent was originally sought. Our grounds for this belief are simply these:—The success of an invention is an uncertainty,—the cost of the patent renders the introduction of an invention a costly experiment,—and to divide his risks and provide against total failure, the patentee seeks for more than one venture on which to rest his hopes of success: thus, by a kind of artificial stimulus, invention fructifies in his brain; and the result of this rapid growth is frequently a numerous but weakly offspring. If the outlay for the patent were a small affair the one original idea wholly failing would be of comparatively little moment to the inventor.

The evils which are clearly traceable to the desire of cramming a host of notions under one patent are of two kinds,—the one bearing solely on the patentee, the other on the inventive community at large.

To any one who has given his attention to the origin of many of the most valuable discoveries of the present age, the first evil to which we allude will readily suggest itself. It may be thus stated:—The crude, unmatured schemes which are frequently found in lengthy specifications, combined with more matured inventions, and possessing perhaps the germ of utility, by being thrust on the world in their undeveloped state, furnish valuable hints to adaptive minds, and form the groundwork of future valuable patent rights; while the *original inventor*, who has perhaps contented himself with indicating a probability, instead of demonstrating a possibility, which

more mature reflection and experience would have enabled him to do, *is wholly superseded.* This, although apparently injustice, is nothing more than the natural result of indiscretion.

The second evil to which we refer, as springing from the cramming system, is the difficulty, almost amounting to an impossibility, of ascertaining the novelty of an invention as respects its relation to prior patents; for, from the adoption of blind or ambiguous titles, the most careful examiner, while attempting to ascertain whether or not a given invention has already formed the subject of a patent, will frequently pass by the very grant which, of all others, it was most necessary for him to see; never imagining for a moment that such an invention as he was in search of would be found under a title apparently quite foreign to his inquiry. Instances of this kind frequently occur, and constitute one of the greatest vexations to which an inventor can be subjected; for, although by the most praiseworthy caution he may have satisfied himself as to the novelty of his plans, prior to taking steps for a patent, he will not unfrequently find himself completely superseded, or, at best, so circumscribed as to be compelled to purchase some patent which has anticipated him, before he can safely work his invention.

From the above observations, it may, we think, be fairly concluded that, by the adoption of a system of cheap protection for ingenuity, the instances in which several inventions were found embodied in one specification would be more rare than at present,—and that, from the absence of the motive which now induces the practice; ambiguous titles would also be less frequently met with,—from the inutility of employing a disguise suited to cover improvements which might suggest themselves during the period which elapses between the application for the patent and the inrolment of the specification.

Now, if there is reason in our statement, that there really exists among patentees a strong desire to "edge off," (as it is termed) by including several ventures in one patent, a stimulus must necessarily be given to invention proportionate to the burden of the pecuniary demand for the patent; the obvious inference to be drawn from which is, that high-priced protection is a fosterer of invention. This is a doctrine to which we must assent, for experience dictates its truth. But how then stands the position of the advocates for high prices, whose only argument for supporting the present tax on patents is, that it limits the number of protected inventions, and thus increases the value of the existing mono-

polies? They are, by upholding the present system, unconsciously forwarding the same object which the advocates for cheap protection avowedly pursue:—viz., the development of inventive skill. The difference between the two parties is, nevertheless, great, for the policy of the one is to provide an unhealthy stimulus for invention, and thereby effect a rapid increase of ideas,—affording but an unsatisfactory result; while that of the other removes the incentive to hasty scheming, and gives encouragement to a spontaneous growth of ingenuity. That England has, under her existing patent laws, profited so largely by the applications of science to the manufacturing arts, is no valid argument for retaining the present scale of patent fees; we have in this, as in numberless other instances, shewn the superiority of the national character in triumphing over difficulties; but now that we have the competition of our neighbours to meet in our own markets, as well as abroad, it would be not merely just but prudent to reconsider, at least, this point of the subject of patent law protection without delay.

In describing the evils which high-priced protection induces, we were led to explain somewhat of the early progress of patents, in order that it might be understood how the patentee was enabled to cram his specification with other inventions than those for which the patent was originally granted. But it must be obvious, that if he could thus, without restraint, insert such discoveries as his experiments, during the six months for perfecting his invention, suggested, he could also, with the same ease, specify other matters to which his right of proprietorship might fairly be questioned. This facility is, in fact, one of the defects of the present system which can command no supporters; the surreptitious possession of an invention is (when the question of conscience is got over) comparatively easy; and its insertion in a specification gives the patentee a title thereto, the validity of which it would, in too many instances, be folly to attempt to question. Two remedies have been suggested for this evil,—1st, the deposit of the specification at the time of applying for protection, as in *all* foreign countries; and, 2nd, the deposit of a *preliminary* specification, embodying the heads merely of the invention. Either of these plans would, if adopted, crush the evil at once; but before such an alteration could be made, certain important provisions would be required; which we shall hereafter fully consider, as they present the main difficulty in the construction of a wise code of patent law; for it is not sufficient to bar the door against the thief,—free access must, at the same time, be given to the honest man.

It would seem to be a comparatively new light in political economy that excessive duties defeat the end for which they are established; or surely the incentives to defraud the national revenue would not exist so plentifully. It is not when we see a poor man attempting to evade an oppressive tax upon some article essential to his comfort, that we are disposed to condemn the law which he is infringing as unjust and oppressive; but when we perceive men of undoubted probity in all the ordinary concerns of life, shamelessly taking part in what, to interpret it truly, is a fraud on the Crown, we may well presume that there is little real justice in the law infringed, and that the sooner the provocation for such a course of action is removed the better for the country. We shall be asserting no more than the experience of many will confirm, when we state, that there is now a growing practice among inventors, and that not of the needy class merely, to come to an "understanding" about the insertion, in one friend's specification, of the invention of another; and thus, by a reciprocity of favors, or for a pecuniary or other donative, to gain the advantage of an earlier date of protection to an invention than could otherwise be obtained, or to save the necessity for incurring the expenses of a distinct patent. By this means the whip-hand is gained over some poor mortal who is shrewdly suspected to be on the same scent as his more successful rival, but who has no friend with an unspecified patent willing to do the kind office of affiliating his invention; the cost of patents to honest and trustworthy individuals is also, by this kind of arrangement, considerably reduced. Even slippery characters, whose object in catching "intending patentees" is to suck their brains and appropriate their ingenuity, are enabled to advantage their intended dupes in a similar way, from the fear of exposure (which involves the loss of the whole of their patent) acting as an inducement to their remaining honest. From these remarks it may be inferred, that a modification of the patent laws would meet with little favor from those who are most interested in their amendment, unless, with the removal of those facilities which the existing system presents for cramming several inventions into one specification, a considerable reduction in the cost of patents were also to accompany such amendment; for otherwise there would be nothing to counterbalance the advantages which would be thereby lost to the inventive community. In bringing forward our case for legislative interference, we should but ill perform our task if we were not to expose a few of the iniquities connected with the working of the patent laws; we would have it understood, however, that it is not our intention to thrust prominently

forward isolated and infrequent cases of fraud, which are, unfortunately, capable of a too easy repetition, nor must it be thought that we would willingly cast a slur on the honesty and uprightness of that class to whose exertions, of all others, this country is most indebted for its continued prosperity. Our desire is not, unnecessarily, to parade irregularities, but merely to indicate what are the imperfections of the law, and what the most usual means taken to render the law subservient to the inventor's interests: the morality of the matter we would leave in the hands of those whose neglect of duty, in their capacity of legislators, is the inducing cause of the malpractices which, we fear, are growing every day more frequent.

ON THE ELECTRICAL CONDITION OF THE HUMAN FRAME, IN REFERENCE TO EPIDEMIC AND OTHER DISEASES.

BY FRANKLIN COXWORTHY, ESQ.,*

Author of "Electrical Condition," &c.

ALL epidemic diseases being now generally referred to some electrical condition in the atmosphere, it is matter of moment that it be determined, in reference to the present prevailing complaint, what really is the electrical condition of the human frame.

Mr. Atkinson, of Westminster, in his remarks on an electrical phenomenon observed by him in cholera, states, "It was indeed singular to notice the quantity of electric fluid which continually discharged itself on the approach of any conducting body to the surface of the skin of a patient labouring under the collapse stage, more particularly if the patient had been previously enveloped in blankets: streams of electricity, many averaging *one inch and a half in length*, could be readily educted by the knuckle of the hand, when directed to any part of the body; and these appeared in color, effect, crackling noise, and luminous character, similar to that which we are all accustomed to observe when touching a charged Leyden jar. I may remark the coincidence, that, simultaneously with the heat of the body *passing off, the electricity was evolved;* and I am therefore led to ask the question,—Are not heat, electric and galvanic fluids, one and the same thing? does not the fact of the *passing off of both imponderable substances*, at one and the same time, strengthen this conclusion?"

* Contributed by the author.

It is evident, from the above extract, that Mr. Atkinson, like all other scientific men of the day, considers that electricity is identified with heat, and that the human body, being always at an elevated temperature by chemical action, induced by respiration, is positively electric, and therefore, when passing into the cold or collapse stage of cholera, evolves free electricity.

All my experiments and all my experience go to shew, that all bodies, whilst evolving heat, are absorbing and not parting with electricity, and, consequently, evolve electricity when "absorbing heat" or "parting with cold;" and therefore, instead of heat and electricity "passing off at one and the same time," they invariably travel in different directions: if in this I am right, as the cholera patient was passing into the collapse or cold state, it is obvious that the fluid must have passed to and not from him, as assumed by Mr. Atkinson.

Crystallization, that was formerly referred to "cold," is now known to be purely an electrical phenomenon; the rapidity of the operation being governed by the amount of electricity supplied; and if a crystallizable salt, in a warm solution, be connected, by a fine copper wire, with a freezing mixture, the formation of the crystals will be rapidly accelerated thereby.

Here then we have clear evidence, not only that electricity is absorbed by a warm body whilst "parting with its heat," but that its connexion with an intensely cold one, by a medium that in no way admits of the passage of "cold," greatly facilitates such absorption.

The above, and other facts, afford unquestionable evidence that electricity, which is evolved during the disintegration of matter, is identified with cold and not with heat; and on reference to *Electrical Condition*, it will be observed, that the same evidence has brought me to the conclusion, that electricity is the bond of union in matter;—and that as bodies attract each other in proportion to their difference of electrical condition, the attraction of matter to the earth's centre (the extreme of *negative* electrical condition) must be in proportion to its density or *positive* electrical condition.

Weight, then, should be nothing more than a kind of indication of the electric force by which a positive electric body is drawn to the negative centre of the earth; and as matter increases in electrical condition in proportion to its density, it follows, as a natural inference, that matter, by compression or contraction, should increase in electrical condition, and therefore in weight.

I have not the means at my disposal to admit of my expressing the result obtained in figures; but I have arrived at

satisfactory evidence that wood, by compression in a small vice,—lead, when passing from the molten state to the cold solid form,—and the admixture of sulphuric acid and water while cooling, *actually increase in weight.**

If we regard the question in its chemical bearings, evidence of a no less satisfactory character is afforded of the relative electrical condition of the human body when in a state of health or fever, or under the influence of an epidemic disease, such as cholera or influenza. If a compound of hydrogen and carbon, such as oleifiant gas, be mixed with oxygen, in the proportion that the oxygen shall be equal only to the conversion of the hydrogen into water, on the mixture being fired by the electric spark, the oxygen and the hydrogen will combine, and the carbon is deposited; but if dead leaves, which contain hydrogen and carbon, be exposed, in a wet state, to the action of oxygen, that gas combines with the carbon, and the whole of the hydrogen is evolved as a light carburet.

Matter, when taken into the system, is converted, under the influence of putrefaction, into carbonic acid and compounds of hydrogen, and the offensive nature of these increases if the temperature of the system be raised by fever; but if, from any cause, the body be thrown into a different electrical condition, the discharges consist of matter possessing but little smell; and during this change of state, or whilst the body is passing into the collapse or cold form, free electricity is absorbed, to supply the demand occasioned by the contraction of the muscles, &c., so evident in the cramp, one of the attendant symptoms of cholera; and the copious discharge of water from the head, during influenza, I consider to be no less characteristic of the electrical condition of the body during the prevalence of that complaint.

It has been suggested that the blue color of the blood in cholera, is referable to the formation of Prussian blue.

Under a negative or healthy state of the body, the oxygen of the air combines with the carbon of the blood, and forms carbonic acid, and the hydrogen and nitrogen are resolved into ammonia; but if the electrical condition be changed to the positive state, the chemical affinities of the elements are transposed. In this positive state, as under the influence of the electric spark, the oxygen, instead of combining with the

* At our suggestion Mr. Coxworthy has furnished us with some evidence on this point; but as it consists merely of the testimony of some unscientific men, who may easily have deceived themselves as to the result of their crude experiments, we do not consider its publication necessary; for it would certainly not carry conviction to the minds of any who may be disposed to doubt the truth of the theory.—[Ed. Lon. Journ.]

carbon, unites with the hydrogen to form vapour, and the carbon and nitrogen, in a nascent state, naturally enter into combination,—the formation of Prussian blue being the result.

In the foregoing statement I have confined myself to a mere detail of principles or facts, as best calculated to elicit truth; and I hope that the evidence it affords will be deemed sufficiently conclusive to induce an enquiry being instituted, in order to determine whether electricity be identified with "heat," or with "cold," or which of the latter is in the positive state, and which in the negative state; it being obvious, that if epidemics be referable to electrical condition, all treatment of those complaints, pending this information, must be mere speculation, and the attempted remedies just as likely to accelerate the complaint as to arrest its progress; and the proportion of recoveries to the deaths cannot, I think, be adduced in proof of any knowledge being possessed of the nature of cholera and influenza.

Were this question merely of a medical character, it would doubtless be out of place in me to urge new views on the consideration *of a body especially constituted by the Crown for its investigation;* but henceforth, medicine being inseparably connected with those branches of science which have so long engaged my attention, I shall not, I am sure, be deemed presumptuous in expressing a hope, that the Honorable the Board of Health will break ground on an inquiry which, in its results, cannot fail in bestowing on society an unprecedented amount of happiness, and in raising the standard of that great endowment which it has pleased the CREATOR to bestow on man above the brute creation.

[Extracts from Foreign Works, translated for the London Journal of Arts.]

On the colors used by the ancients in painting.—Chemical researches upon several objects of archæology discovered in the department of la Vendée.

By M. CHEVREUL, of the Academy of Sciences, Paris.

THE objects which formed the subject of these researches were found, in 1845 and 1846, in the tomb of a Gallo-romaic female artist, in a villa discovered at Saint Médard-des-prés, at a distance of about a mile from Fontenoy, in the department of la Vendée, near the river of that name. A young magistrate, M. Benjamin Fillon, having described them with the enthusiasm which characterizes those who have a taste for national archæology, sent them to M. Chevreul, in conformity with the desire expressed by M. Letronne, who undertook to examine them chemically.

These objects were most especially intended for painting purposes, and were found to consist of the following compounds:—

First, there were colored metallic oxides, none of which were

pure. Four of the specimens were principally composed of carbonated oxides of lead and copper, and peroxide of iron, but none of them seemed very bold colors.

A fifth specimen contained, besides the three oxides above mentioned, phosphate of iron.

A sixth, besides the carbonated oxide of lead and copper, and peroxide of iron, contained a considerable proportion of oxide of zinc, together with a trace of oxide of manganese and phosphoric acid.

M. Chevreul, on examining a seventh substance, obtained two remarkable results; first, it was found to be principally composed of Verona earth and a blue coppery substance, which appeared to have all the properties of Egyptian blue (this substance M. Girardin had previously discovered in objects found in Normandy); secondly, M. Chevreul found that the same mixture was employed for encaustic painting upon lime cement.

Amongst the utensils used for painting, there was a color-box made of thin bronze, which required to be bent backwards and forwards a great many times before it would break.

Organic matters were also found in the tomb, such as ambergris candles for fumigation, vegetable pitch, obtained from the pine, beeswax, fusible at 64°, a preparation of wax and resin, and what is remarkable, another preparation composed of oleic acid, containing margaric acid, wax, and lamp-black. Were the fatty acids produced by the decomposition of a saponifiable fatty body, which had been originally combined with the wax and lamp-black, or were they mixed, after having been separated from a soap decomposed by vinegar or lemon juice? This is a question to which no decided answer can now be given.

Lastly, M. Chevreul examined two fragments of painting done upon a cement made with lime and sand. The ground of one of the fragments was the mixture of Verona and Egyptian blue above mentioned; and the carnation of a figure painted upon that ground, after its perfect dessication, was found to have been made with peroxide of iron mixed with chalk or lime diluted with water. These paintings only contained traces of an organic matter soluble in alcohol.

These fragments of painting had been laid bare by trenching in the ruins of a villa near the tomb of the female artist above alluded to.

ON THE PREPARATION OF HYPOCHLORITE OF SODA.

BY M. G. REICH.

In preparing hypochlorite of soda by M. Reich's method, about 2 lbs. of effloresced carbonate of soda are placed in a shallow perforated plate or vessel of porcelain or wood, having a rim all round it, and this is placed in another porcelain vessel, which is furnished with a cover of the same material. This cover is provided with two tubular openings to receive two bent pipes, the stoppers of which are covered with wax. One end of one of these pipes extends below

the layer of carbonate of soda, and the other is placed in a receiver containing a solution of that carbonate. The first of these tubes, on proceeding from the vessel, and after being twice bent, enters a glass vessel containing water holding in suspension a small quantity of hydrate or carbonate of lime; which liquid is made to communicate by means of a second bent tube with a porcelain vessel or cylinder, also closed by a cover of the same material, and having two tubular openings. The lime vessel is indispensably necessary to regulate the disengagement of the gas.

Into the porcelain cylinder 4 lbs. of powdered peroxide of manganese are introduced; the apparatus is then closed, and luted with a mixture composed of 2 parts of wheat flour and 1 of linseed flour; and a funnel having been placed in the second opening, a mixture is poured through it composed of 7 parts of hydrochloric acid of commerce, of sp. gr. 1.16, and 2 lbs. of concentrated sulphuric acid. Things being thus arranged, the cylinder is immersed in a steam apparatus (it being introduced through an aperture expressly made for that purpose, and into which it fits exactly), and at the same time the first mentioned porcelain vessel is plunged in a vessel of cold water to keep it cool: the steam apparatus is then heated. The chlorine which escapes from the cylinder passes quickly into the porcelain vessel (which must be kept cool by a constant supply of fresh cold water), where it is quickly absorbed by the effloresced carbonate of potash. During this operation care must be taken to stir, from time to time, the carbonate of soda contained in the porcelain or wooden vessel with a rod of iron passed through one of the tubular openings, in order to present fresh surfaces continually to the chlorine. As soon as the absorption of the gas ceases, the hypochlorite of soda already formed is removed and kept in the dark in a well closed vessel, covered with paper or a layer of lac varnish. The residuum in the cylinder may, after saturating the acid with lime, be employed for the preparation of vitriol or sulphate of manganese.

If porcelain vessels of the above description cannot be obtained,* glass vessels may be used, and the apparatus mounted in the same manner. In order to disengage the chlorine, a mixture may be employed consisting of 4 lbs. of peroxide, 4 lbs of marine salt, and 10 lbs. of sulphuric acid, diluted with its own weight of water.

Also, in order to favour the absorption of the chlorine, 20 parts of effloresced carbonate of soda may be damped with 1 part of water; but in that case it is to be feared that the mass will shrink and lose its lightness and permeability. The product obtained is a mixture of hypochlorite of soda, chloride of sodium, and bicarbonate of soda: it possesses a peculiar smell. One

* It is worthy of observation that the two porcelain vessels, viz., the porcelain vessel and the cylinder (which have a capacity of from 12 to 15 quarts), may be advantageously employed in a variety of chemical and pharmaceutical operations; and the cylinder with its bath will serve as a substitute for the old retort for various kinds of distillation.

part of this product dissolved in twelve of water produces a bleaching liquor, called by the French *eau de javelle,* and one part dissolved in eight of water furnishes *Labarraque's liquor.* These liquors, it is well known, are advantageously employed for bleaching and purifying linen; for they will remove stains without injuring the fibre,—as hypochlorite of soda possesses the property of destroying all vegetable colours, and destroys offensive odours: they are likewise antiseptic.

Labarraque's liquor is prepared, as is well known, by dissolving 15 parts of carbonate of soda in 40 parts of water, filtering, and passing through the solution chlorine gas, produced by a mixture of 6 parts of hydrochloric acid and 2 parts of pulverized peroxide of manganese. A similar liquor may also be obtained by decomposing one part of hypochlorite of hydrate of lime (chloride of lime) by an aqueous solution of carbonate or sulphate of soda, made with 2 parts of salt and 45 parts of water, and filtering the liquor.

By mixing intimately 1 part of chloride of lime with 2 parts of carbonate of soda, and adding 1 part of water,—then letting the mixture settle for some time,—afterwards adding 1 or 2 parts of water, and filtering the liquor, in order to separate the carbonate of lime formed, and immersing the filtered liquid in snow, ice, or a refrigerating mixture, crystallized hypochlorite of soda will be produced.

REDUCTION OF SULPHATE OF LEAD INTO METALLIC LEAD.

In calico printing works a large quantity of sulphate of lead is produced in the preparation of alumina by the decomposition of acetate of lead by alum: this substance was for a considerable time thrown away, as no use could be found for it. It has, however, been discovered that metallic lead may be obtained from it by reducing it by means of zinc or iron. This reduction is found to be attended with great difficulty if a pure salt be employed; but according to M. M. Trommsdorf and Herman, reaction is readily produced under the influence of certain salts, and amongst others of common salt.

The method of proceeding is as follows:—100 parts of sulphate of lead are mixed with 10 parts of common salt and water, so as to form a thin paste, and lumps or sheets of metallic zinc are placed therein, or are covered with a layer of the saline mixture to a depth of from half an inch to an inch. The white mass soon changes into a grey matter, which is metallic lead impregnated with sulphate of zinc and common salt; and by washing and melting very pure lead is obtained. Or it may be well washed without melting, and employed in that state for the preparation of ceruse or acetate of lead.

It will be found that the porous and comminute state of the lead thus obtained by reduction renders it very apt to oxidize by contact with the atmosphere, even without the aid of heat. Exposed to the simultaneous action of a little acetate of lead and

an atmosphere rich in carbonic acid, it is with great facility converted into very white ceruse. In the white lead manufactories, where the Dutch method is in use, plates of porous lead (prepared simply by subjecting to rather strong compression the lead obtained, in the state of fine powder, by the reduction of the sulphate of lead by means of zinc) may be employed instead of thin sheets of lead rolled in a spiral form.

SIMPLIFIED METHOD OF EMPLOYING CHARCOAL IN GALVANIC APPARATUS.

It is well known that M. Bunsen was the first who made known the mineral charcoal apparatus for the production of a powerful and constant electric current; but this apparatus is expensive and soon wears out. It has also been found that the attempt to set it in action is not always attended with success. The platina apparatus is less easily broken; but the metal in sheets is soft and pliant. The objections against it seem to be, that it requires a very large quantity of nitric acid and zinc to keep it in action; and that its action ceases, after lasting about eight or ten hours,—from the formation of sulphate of zinc, which is deposited on the cylinder of the same metal, and prevents the development of electricity.

M. H. Reinsch only uses coarse coke powder, which he puts in an earthen capsule, and damps well with ordinary aquafortis. In this acidified coke powder he places a small piece or cylinder of coke, at the end of which a copper wire is rolled. The action is very extraordinary. The discharging cylinder of an electro-magnetic machine, made according to M. Desaga's model, cannot be held with dry hands; and a capsule or cell of this description does not appear, after three days' activity, to be at all diminished in intensity. As the powdered coke costs a mere nothing, and will always serve again (for when the acid has become gradually weaker, it is sufficient to dry it in the air, and damp it again with aquafortis, to produce a constant current), it will be seen that an immense advantage is thus presented to persons using galvanism, as the expense of developing the electric action is considerably reduced; and if ever the application of magnetism, as motive power, is realized, M. Reinsch's valuable observations will be of very great importance.—[*Technologiste.*]

NEW MODE OF PREPARING CARBONATE OF POTASH.

An interesting fact has been recently discovered by Messrs. W. B. and C. R. Rogers, American chymists, which may prove of great utility in practice. It is, that by reducing wood to fine powder or sawdust, and washing it with water impregnated with carbonic acid, all the potash may be extracted in the form of carbonate.

Experiments have proved this to be the case, more particularly with maple, oak, and walnut. It had been imagined hitherto that the only method of extracting this substance from wood was

by incineration. The present process, however, effects the same object by very different means, and offers the advantage of producing a larger quantity of carbonate than is obtained by incineration; for this reason—that it appears to have been proved by Messrs. Rogers that potash and soda, as well as their carbonates, and more particularly that of the former, are volatile at a red heat like that of incineration, and consequently are driven off in the form of vapour at that temperature.—[*Ibid.*]

REVIEW.—*The High-Pressure Steam-Engine:—An exposition of its comparative merits, and an essay towards an improved system of construction. By* DR. ERNST ALBAN. *Translated from the German, with notes, by* WILLIAM POLE, C.E. *Parts III. and IV.*—J. Weale, High Holborn.

[Second Notice.]

SOME months ago we took occasion to notice the 1st and 2nd parts of Dr. Alban's work on the steam-engine, and at that time we promised ourselves an early opportunity of recurring again to the subject, when the work should be completed. We have, however, until now been prevented from so doing, partly by the delay in the publication of the remaining parts, occasioned, we believe, by the indisposition of the translator. The author, being a man of considerable practical experience, has, by recording the results of his many tedious and costly experiments, which were directed to ascertain the best proportion and mode of construction of the various parts of his engines, boilers, and furnaces, rendered to science a service the opportunity of effecting which is too frequently neglected by practical men in England. Our author's ideas upon the subjects on which his book treats may not perhaps in their entirety square with our English notions; but there is, nevertheless, very much of valuable matter set forth in a concise and intelligible manner. The text is, indeed, remarkable for its simplicity of diction and perspicuity of style, and is therefore well suited to the capacity of the humblest mechanic or engine-driver: it is illustrated in the most ample manner by plates, engraved in Mr. Gladwin's best style, shewing, when necessary, detailed as well as general views. As a conclusion to Part II., the completion of which was reserved to the present volume, the author gives a detailed description of a large tubular boiler, of peculiar construction, devised by himself, and found to answer extremly well in practice.

Tubular boilers have, as is well known, been long in use, under various modifications in this country; but the author appears to consider that such constructions as have come under his notice are deficient in some essential matters. After giving upwards of twenty years' attention to this subject, he has contrived a boiler with tubes placed horizontally, in rows over each other, in such a manner that each row should lie over the interstices of the row immediately below it, whereby the heated current, in passing upwards, is compelled to follow in thin streams, a zigzag course,

and thus to strike, as nearly as possible, perpendicularly against the under surfaces of the tubes. This mode of constructing boilers does not, we think, present much novelty as regards principle; but the manner in which the author carries out his ideas appears ingenious and worthy of attention. He says he could not, for a long time, succeed in carrying out his plan, owing to the want of a satisfactory method of connecting the large number of tubes with each other and with the necessary receivers, so that the steam might be led away without interfering with the proper water-feed, and also so perfectly separated from the water as to leave no danger of priming in the engine. At length, however, having succeeded in accomplishing his object, he constructed an improved boiler, which, although made merely as an experiment, far exceeded his expectations; the production of the steam being so regular and the whole arrangement being so safe and convenient.

This boiler consists of three principal parts, viz., 1st.—The steam generators or boiling tubes. 2nd.—Flat narrow vessels or chambers, to which one end of the boiling tubes is connected, and which chambers serve the double purpose of supplying the boiling tubes or generators with water and also lead away the steam. These narrow vessels or chambers the author denominates "hearts," as they keep up a continued circulation of water and steam throughout the boiler. 3rd.—The separators and receivers, the use of which is, first, to separate the dry steam from the water which comes over with it; and second, to receive the said steam in a dry state, and furnish it, in this condition, to the boiler. The principal novelty in this boiler, independent of the peculiar arrangement of the several parts, relates to the method of constructing the steam generators or boiling tubes, so as to keep up a continued circulation therein. Their back ends are closed by a screw-cover, which, when required, may be removed for cleaning; and their front ends are screwed into the back plate of the "heart," in such a manner that they may be removable with facility when worn out, or for other causes. The interior of the tubes communicates with the interior of the heart through two oval openings made in the back of the heart, one above the other: the upper opening conveys away from the tube the steam as it is generated therein, and the lower opening serves to supply the tube with water as the evaporation proceeds. It would be extremely difficult to give more than a general idea of this boiler without the aid of drawings; we must therefore refer the reader to the work itself, where the author has accompanied his description with a number of practical suggestions, which will, no doubt, prove extremely valuable to engineers when constructing boilers of this kind.

Although, with regard to furnaces, the author has not favored us with any new lights, still he has thrown out a great many useful hints as to the proper height and area of chimneys to produce a good draft, under various circumstances; the best form and arrangement of flues and fire-bars; the practical advan-

tages or disadvantages of brick or iron furnaces for boilers; and a variety of other matters of interest to the practical engineer.

Part III. is devoted exclusively to the consideration of the engine and its working parts. The author opens this part of his subject by discussing the comparative advantages and disadvantages incidental to oscillating engines, and has in a very fair and impartial manner examined both sides of the question. After weighing the comparative merits of, and objections to, the oscillating engine, he decided in favor of its adoption, and turned his attention to the best means of removing the grounds of objection hitherto urged against that principle of construction. Although engines with oscillating cylinders were first proposed in 1802 by Trevethick, and have subsequently received considerable attention from engineers of high standing, it is only within a comparatively short time that they have been brought into general use,—notwithstanding the advantages which they clearly possess; the objections to them having, until lately, been considered too weighty, and not compensated by corresponding advantages. One of the principal objections made against engines of this construction was the want of a convenient mode of working the valves; this difficulty, however, Mr. Maudslay in a great measure surmounted, by the adaptation of the slide-valve, whereby the oscillating engine was rendered a really good working machine. Some further improvements were subsequently made in the valves and gearing of this description of engine by Mr. Spiller, and others; but the ultimate success of the oscillating engine is mainly attributable to the zealous and careful attention of the Messrs. Penn, of Greenwich, to all the details of the engine; whereby it was brought into very general notice, and is now very favorably looked upon by most engineers. The most weighty objection in the opinion of Dr. Alban to oscillating cylinders, especially in large engines, is the great friction of the trunnions upon which the cylinder swings. This friction increases in a serious degree with the increase of temperature, particularly when there is any considerable pressure; and as, according to the plan generally adopted, the steam is admitted to the cylinder through the trunnions, the evil is greatly enhanced. The author proposes to obviate this objection to a considerable extent by supplying the steam to the cylinder through passages and valves which have no connection with the trunnions; the office of these latter being strictly confined to supporting the cylinder in its bearings. By this means the trunnions remain cold, or at least (even when the engine has been long at work) never reach a temperature that has an injurious influence on the friction. Dr. Alban suspends his cylinder in what he calls a "trunnion frame," which is mounted in plummer blocks on the top of the main framing, instead of its being supported by gudgeons near the middle, as is usually the case. The valve apparatus is placed on the upper cover of the cylinder, and the piston rod passes out of the lower cover at the opposite end of the cylinder, and is connected in the ordinary way to the crank-pin. By this arrangement the trun-

nions are prevented from getting heated to such an extent as would greatly increase the friction; and the valves are very conveniently placed, and not so liable to derangement as when connected with the trunnions or gudgeons.

In Part IV., which concludes the work, the author offers some general remarks on the consumption of fuel, and furnishes statistical information relative to the working of some of his engines;—his methods of estimating the power, and a statement of the general dimensions and proportions of the principal parts of the engines are also given. In reference to the application of steam-engines to the working of machinery of various kinds, Dr. Alban strongly urges the importance of adapting the arrangement of the engine to the nature of the work required to be effected; he then gives examples of high-pressure engines, constructed upon his plan, as applied to various purposes; such, for instance, as an arrangement for marine engines, a single-acting pumping engine for pumping water, a direct-action engine for driving a vertical shaft—as in millwork for grinding corn, and other engines for different uses.

In our former notice of this work we had occasion to express our approbation, not only of the manner in which the subject was treated, but also of the very creditable way in which the work was got up; the plates, and also the general getting up of the present parts, are well deserving of commendation; it being evident that no expense has been spared to render the work worthy of a place in the library of every engineer.

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1849.

Jan. 27. *Frost, Noakes, & Vincent,* of 195, Brick-lane, Whitechapel, London, for a steam pressure gauge.

29. *Rebecca & Emma Alcock,* of Doctors Commons, for a bust improver.

30. *Samuel Sheppard,* of James-street, Harper's Hill, Birmingham, cock founder, for an improved tap.

30. *Barwell & Co.,* of Northampton Eagle Foundry, for the patent hemispherical heat diffusing stove.

31. *J. Robinson & Co.,* of Commercial-road East, for an improved waistcoat.

Feb. 2. *Robert Adolphe Farmer,* of 40, Mount-street, Lambeth, for a case bottle stopper.

2. *Joseph & Edmund Ratcliff,* of Birmingham, for a spring for opening and closing the covers of ink and other vessels.

2. *Frederick Westley,* of the Strand, London, envelope manufacturer, for the "Polychrest" envelope.

2. *Thomas Smith,* of Princes-street, Lambeth, drain pipe manufacturer, for the automatic or self-acting flushing apparatus.

Feb. 3. *Jonathan & Clement Hazell*, of 24, Gloucester-street, Clerkenwell, for the paragon spring swivel.

5. *Thomas Wharton*, of Great Charles-street, Birmingham, manufacturer, for the Victoria ink pot.

6. *John Oliver York*, of Covent-garden, for an instrument for measuring diameters.

7. *Josiah Jackson*, of Birmingham, for a pen.

7. *William Riddle*, of East Temple Chambers, Whitefriars, for a self-igniting gas-burner.

7. *Campbell & Mc Nab*, of Greenock, engineers, for apparatus for casting sugar-moulds.

7. *John Key*, of Wemyss Colliery, Fife, engineer, for stop-cutting apparatus for tile machinery.

8. *S. Newington*, of Keale Park, Frant, Tonbridge Wells, Kent, for a hand-row hoe and cultivator.

8. *Joseph Tillcock*, of 102, Bond-street, for the "*haut-ton* vesture."

8. *Bedington & Docker*, of Birmingham and London, manufacturers, for the double Argand lamp.

9. *Ebenezer Ranwell*, of 25, Red Cross-square, City, London, for an improved scale-pan for weighing and discharging coal and other materials.

9. *William Winsor*, of 38, Rathbone-place, London, for Harding's lesson desk.

9. *Elias & Reuben Levy*, of Market-street and Shudehill, Manchester, merchant tailors, for the Leviathan vest.

9. *Joseph Lillie*, of Store-street Works, Manchester, engineer, for an improved boiler with internal flues.

9. *Samuel Clutton*, of 79, Praed-street, Paddington, and 14, Oxford-mews, Cambridge-square, builder, for the cold draught preventor.

10. *J. N. Marshall*, of Frogmore-street, Bristol, for the heated air propeller.

10. *Henry Lillington Marshall*, of 516, New Oxford-street, and *Samuel Bayliss*, of Museum-street, Bloomsbury, for an adjuster to be applied to braces and fastenings for waistcoats, trousers, drawers, belts, &c.

14. *Scholefield & Sons*, of Birmingham, for a "gamella" or gold washer.

14. *Job Clark*, of Willenhall, Staffordshire, bolt manufacturer, for a safety spring bolt.

15. *Thomas Harris Busbridge & George Frederick Busbridge*, of East Malling Mills, in the county of Kent, for a dandy roller for paper making.

15. *Deane, Dray, & Deane*, of King William-street, London-bridge, for an improved cinder sifter.

16. *George Allen*, of Stepney, engineer, for a safety catch for the handles of railway and other carriage doors.

Feb. 19. *Edward Newman Fourdrinier*, of 9, College-place, Camden-town, for a hat suspender.

20. *William Burgess*, of 250, Blackfriars-road, London, for the gutta-percha label holder.

20. *Welch, Margetson, & Co.*, of 134, Cheapside, for the self-adjusting aerial stock.

22. *Marie Maurice Gariel*, M.D., of Paris, for the "aquæductor," for surgical purposes.

23. *George Shardlow*, of Parliament-street, Nottingham, for a body gauge.

24. *Edouard Belmer*, of Peter-street, Wardour-street, Westminster, machinist, for an improved spring lever for spring hats.

24. *Sabrina De Caulier*, of 42, Coleman-street, for a shirt or under garment for males and females of all ages.

24. *Robert Wilson & William Wilson*, both of Wardour-street, Soho, London, for a shower bath.

List of Patents

That have passed the Great Seal of IRELAND, from the 17th January to the 17th February, 1849, inclusive.

To John Mitchell, chemist, Henry Alderson, civil engineer, and Thomas Warriner, farmer, of Lyons Wharf, Upper Fore-street, Lambeth, in the county of Surrey, for improvements in smelting copper.—Sealed 14th February.

William Clay, of Clifton Lodge, in the county of Cumberland, engineer, for certain improvements in machinery for rolling iron or other metals,—parts of which improvements are applicable to other machinery in which cylinders or rollers are used.—Sealed 14th February.

List of Patents

Granted for SCOTLAND, subsequent to January 22nd, 1849.

To William Martin, of St. Pierre les Calais, France, for certain improvements in machinery for figuring textile fabrics; parts of which improvements are applicable to playing certain musical instruments, and to printing and other like purposes.—Sealed 24th January.

Joseph Deely, of Newport, Monmouthshire, engineer, for improvements in ovens and in furnaces.—Sealed 24th January.

Lawrence Hill, jun., of the Motherwell Iron-works, near Hamilton, civil engineer, for improvements in the manufacture of iron and in the machinery for producing the same,—being a communication. Sealed 31st January.

Alexander Parkes and James Parkes, of Birmingham, for improvements in the manufacture of metals and alloys of metals, and in the treatment of metallic matters with various substances.—Sealed 31st January.

Francis Hay Thomson, of Hope-street, Glasgow, M.D., for an improvement or improvements in smelting copper or other ores.—Sealed 2nd February.

Ewald Riepe, of Finsbury-square, London, merchant, for improvements in the manufacture of soap,—being partly a communication. Sealed 5th Febuary.

David Napier and James Murdoch Napier, of the York Road, Lambeth, London, engineers, for improvements in mariners' compasses; also in barometers and in certain other measuring-instruments.—Sealed 5th February.

Rees Reece, of London, chemist, for improvements in treating peat and obtaining products therefrom.—Sealed 5th February.

Edmund George Pinchbeck, of Fleet-street, London, for improvements in certain parts of steam-engines.—Sealed 5th February.

James Robertson, of Great Howard-street, Liverpool, cooper, for improvements in the manufacture of casks and other wooden vessels, and in machinery for cutting wood for those purposes. Sealed 5th February.

Fennell Allman, of 18, Charles-street, St. James's-square, Westminster, consulting engineer, for improvements in apparatus for the production of light from electricity.—Sealed 7th Feb.

Achille Chaudois, of Paris, manufacturing chemist, for improvements in extracting and preparing the coloring matter from orchil.—Sealed 7th February.

Thomas De la Rue, of Bunhill-row, London, manufacturer, for improvements in producing ornamental surfaces to paper and other substances.—Sealed 9th February.

Jonah Davies and George Davies, of the Albion Foundry, parish of Tipton, Staffordshire, iron-founders, for improvements in steam-engines.—Sealed 9th February.

Samuel Brown, the younger, of Lambeth, engineer, for improved apparatuses for measuring and registering the flow of liquids and of substances in a running state; which apparatuses are in part also applicable to other useful purposes.—Sealed 12th February.

Hugh Bell, of London, for certain improvements in aerial machines and machinery in connection with the buoyant power produced by gaseous matter.—Sealed 19th February.

William Clay, of Clifton Lodge, county of Cumberland, engineer, for certain improvements in machinery for rolling iron or other metals; parts of which improvements are applicable to other machinery in which cylinders or rollers are used.—Sealed 19th February.

Carey M'Clellan, of Larch Mount, Liberties of Londonderry, for an improved corn-mill.—Sealed 20th February.

Emanuel Miller, of Baltimore, Maryland, United States of America, for certain improvements in dressing or cleaning grain, and in separating extraneous matters therefrom,—being a communication. Sealed 21st February.

James Baird, of Gartsherrie, Lanarkshire, iron-master, and Alexander Whitelaw, of Gartsherrie iron-works, manager of said works, for improvements in the method or process of manufacturing iron.—Sealed 21st February.

New Patents
SEALED IN ENGLAND.
1849.

To Ewald Riepe, of Finsbury-square, Middlesex, merchant, for improvements in the manufacture of soap,—being a communication. Sealed 30th January—6 months for inrolment.

Alexander Wilkins, brewer, and William Stacey, engineer, for a certain improvement or improvements applicable to heating and boiling of liquids of any kind or description. Sealed 30th January—6 months for inrolment.

Lemuel Wellman Wright, of Chalford, in the county of Gloucester, civil engineer, for certain improvements in preparing various fibrous substances for spinning, and in machinery and apparatus connected therewith. Sealed 30th Jan.—6 months for inrolment.

William Kenworthy, of Blackburn, in the county of Lancaster, cotton spinner, for certain improvements in power looms for weaving. Sealed 31st January—6 months for inrolment.

Henry Bessemer, of Baxter House, Old Saint Pancras-road, in the county of Middlesex, engineer, for certain improvements in the manufacture of glass, and in apparatus connected therewith. Sealed 31st January—6 months for inrolment.

Jean Adolphe Cartéron, of Paris, in the Republic of France,—now of the Haymarket, in the county of Middlesex, chemist, for certain improvements in dyeing. Sealed 5th February—6 months for inrolment.

John Browne, of Great Portland-street, in the county of Middlesex, Gent., for improvements in constructing and rigging vessels, and improvements in atmospheric and other railways. Sealed 6th February—6 months for inrolment.

Edmund George Pinchbeck, of Fleet-street, in the City of London, for improvements in certain parts of steam-engines. Sealed 6th February—6 months for inrolment.

Thomas Snowden, of Noel-street, in the county of Middlesex, engineer, for improvements in machinery for moulding and pressing artificial fuel and bricks. Sealed 6th February—6 months for inrolment.

Joseph Harrison, of Blackburn, in the county of Lancaster, machine maker, and William Harrison, of the same place, cotton manufacturer, and John Oddie, also of the same place, manager, for certain improvements in and applicable to looms for weaving. Sealed 6th February—6 months for inrolment.

Henry Fisher, of Upholland, in the county of Lancaster, Gent., for improvements in coke-ovens, and in machinery and apparatus for working the same, or connected therewith; and a mode or modes of applying certain portions of coke, or the residual products of coke, to heating and lighting. Sealed 8th February—6 months for inrolment.

Lawrence Hill, jun., of Motherwell Iron Works, near Hamilton, Lanarkshire, civil engineer, for improvements in the manufacture of iron, and in the machinery for producing the same,—being a communication. Sealed 8th February—6 months for inrolment.

Henry Headley Parish, of Eaton-place, Middlesex, Esq., for improvements in safety and other lamps, and in gas-burners,—being a communication. Sealed 8th February—6 months for inrolment.

Richard Pannell Forlong, of Bristol, button manufacturer, for improvements in castors for furniture. Sealed 8th February—6 months for inrolment.

James Webster, of Basford, in the county of Nottingham, engineer, for certain improvements in apparatus for manufacturing gas. Sealed 8th February—6 months for inrolment.

Joseph Barnes, of Church, in the county of Lancaster, for an improved apparatus for bleaching, dyeing, clearing, and steaming animal or vegetable fibrous substances, either in a raw or manufactured state. Sealed 8th February—6 months for inrolment.

Robert Brown, of Sadlers Wells, in the county of Middlesex, engineer, for improvements in machinery for perforating, sewing, stitching, pegging, and rivetting. Sealed 8th February—6 months for inrolment.

William Wilcox Sleigh, of Stamford Brook House, Chiswick, in the county of Middlesex, Doctor of Medicine, for a means of preventing injuries to persons and property, from the sudden stoppage of railroad carriages. Sealed 8th February—6 months for inrolment.

John Taylor, of Parliament-street, architect, for an improved mode of constructing and fencing walls. Sealed 8th February—6 months for inrolment.

William Tooth, of Broad-street, Lambeth, engineer, for improvements in water-closets and in chimney-pieces; in machinery for the preparation of clays and other materials, and in the manufacture of earthenware articles. Sealed 8th February—6 months for inrolment.

Thomas Charles Clarkson, of Bennett-street, Southwark, manu-

facturer, for improvements in the manufacture and application of leather, and of certain vegetable substances to be used in combination with leather, India-rubber, canvas, silk, cotton, wool, and other fibrous substances, in the manufacture of certain waterproof articles. Sealed 8th February—6 months for inrolment.

John Giblett, of Trowbridge, in the county of Wilts, Gent., for improvements in the manufacture of woollen cloth. Sealed 10th February—6 months for inrolment.

George Edward Donisthorpe, of Leeds, manufacturer, and James Milnes, of Bradford, both in the county of York, for improvements in apparatus used for stopping steam-engines and other first movers. Sealed 12th February—6 months for inrolment.

Jarvis Palmer, of Camberwell, merchant, for improvements in matches, lighters, or similar articles, for igniting combustible bodies; in the mode or modes of manufacturing the same, and in machinery applicable therein; also in match and other boxes, and in machinery for manufacturing the same. Sealed 12th February—6 months for inrolment.

William Harris, of Battersea, in the county of Surrey, shoemaker, for a new or improved mode of preparing leather. Sealed 12th February—6 months for inrolment.

William Brewer, of Malcolm-place, Clapham, Surrey, and John Smith, of Southville, South Lambeth, manufacturers, for certain improvements in the manufacture of paper and card-board, and in producing water-marks thereon; and also in apparatus and machinery to be used for such purposes. Sealed 12th February—6 months for inrolment.

Christopher Nickels, of York-road, Lambeth, Surrey, for improvements in the manufacture of woollen and other fabrics. Sealed 12th February—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in engines or apparatus principally designed for pumping water,—being a communication. Sealed 12th February—6 months for inrolment.

Matthew Townsend, of Leicester, frame-work knitter, and David Moulden, of the same place, frame-work knitter, for improvements in machinery for the manufacture of looped fabrics. Sealed 13th February—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in machinery for hulling and polishing rice and other grain or seeds,—being a communication. Sealed 13th February—6 months for inrolment.

Edward Lord, of Todmorden, in the county of Lancaster, machinist, for certain improvements in machinery or apparatus applicable to the preparation of cotton and other fibrous substances. Sealed 13th February—6 months for inrolment.

Achille Chaudois, of Faubourg du Temps, Paris, in the Republic of France, manufacturing chemist, for improvements in extracting and preparing the coloring matter from orchil. Sealed 14th February—6 months for inrolment.

William Chambers Day, of Birmingham, iron founder and weighing machine manufacturer, for improvements in machinery for weighing. Sealed 14th February—6 months for inrolment.

Hugh Lee Pattinson, of Washington House, Gateshead, in the county of Durham, chemical manufacturer, for improvements in manufacturing a certain compound or certain compounds of lead, and the application of a certain compound or certain compounds of lead to various useful purposes. Sealed 14th February—6 months for inrolment.

Richard Ford Sturges, of Birmingham, Britannia-ware manufacturer, for improvements in the manufacture of candlesticks and lamp pillars. Sealed 14th February—6 months for inrolment.

John Erwood, of Hoxton, paper-hanging manufacturer, for improvements in the manufacture of paper-hangings. Sealed 15th February—6 months for inrolment.

Charles Thomas Pearce, of Park-road, Regent's-park, Esq., for improvements in apparatus for obtaining light by electric agency. Sealed 16th February—6 months for inrolment.

Charles Frederick Whitworth, of Hull, Gent., for improvements in preventing accidents on railways. Sealed 17th February—6 months for inrolment.

John Bottomley, of Bradford, in the county of York, manufacturer, for improvements in machinery for weaving. Sealed 22nd February—6 months for inrolment.

Disclaimer and Amendment

OF PART OF AN INVENTION

MADE UNDER LORD BROUGHAM'S ACT.

Disclaimer filed on the 16th February, 1849, with the Clerk of the Patents for England, to part of the specification of a patent granted on the 5th May, 1846, to Peter Carmichael, manager for Baxter, Brothers, and Co., for his invention of "improvements in hackling or dressing flax, hemp, and other fibrous substances; and improvements in machinery for rubbing, stretching, and equalizing the breadth of cloth made from flax, hemp, jute, and other fibrous substances."

CELESTIAL PHENOMENA FOR MARCH, 1849.

D.	H.	M.	
1			Clock before the ☉ 12m. 35s.
	—		☽ rises 10h. 13m. M.
	—		☽ pass. mer. 5h. 49m. A.
	—		☽ sets 0h. 24m. M.
	11	35	♃'s third sat. will em.
	12		♀ greatest elong. 46. 22. E.
2			Occul. 130 Tauri, im. 11h. 35m. em. 12h. 28m.
	0	3	☽ in □ or first quarter
3			Occul. 26 Geminorum, im. 9h. 16m. em. 10h. 22m.
4	11	56	♃'s first sat. will em.
5			Clock before the ☉ 11m. 45s.
	—		☽ rises 1h. 55m. A.
	—		☽ passes mer. 9h. 37m. A.
	—		☽ sets 4h. 27m. M.
	10	5	♃'s fourth sat. will im.
	14	51	♃'s fourth sat. will em.
6	1	3	♃ in conj. with the ☽ diff. of dec. 3. 35. N.
	6	24	♃'s first sat. will em.
	11	20	♃'s second sat. will em.
7	21	9	☿ stationary.
8	10	12	First contact } Partial Eclipse of the Moon.
	12	55	Middle
	15	38	Last contact
	15	34	♃'s third sat. will em.
9	1	2	Ecliptic oppo. or ○ full moon
	—		Occul. 13 Virginis, im. 14h. 37m. em. 15h. 45m.
9	20		♀ in Perihelion
10			Occul. k Virginis, im. 9h. 29m. em. 10h. 11m.
10			Clock before the ☉ 10m. 28s.
	—		☽ rises 7h. 45m. A.
	—		☽ passes mer. 0h. 57m. M.
	—		☽ sets 7h. 6m. M.
11	13	50	♃'s first sat. will em.
13	8	19	♃'s first sat. will em.
	18	57	♃'s second sat. will em.
14			Mercury R. A. 22h. 0m. dec. 11. 54. S.
	—		Venus R. A. 2h. 24m. dec. 17. 59. N.
	—		Mars R. A. 20h. 53m. dec. 18. 37. S.
	—		Vesta R. A. 1h. 50m. dec. 6. 6. N.
	—		Juno R. A. 5h. 48m. dec. 10. 47 N.
	—		Pallas R. A. 18h. 1m. dec. 11. 8. N.
	—		Ceres R. A. 18h. 25m. dec. 22. 22. S.
	—		Jupiter R. A. 9h. 4m. dec. 17. 46. N.
	—		Saturn R. A. 23h. 54m. dec. 5. 52. S.
	—		Georg. R. A. 1h. 17m. dec. 7. 31. N.
	—		Mercury passes mer. 22h. 31m.

D.	H.	M.	
14			Venus passes mer. 2h. 56m.
	—		Mars passes mer. 21h. 24m.
	—		Jupiter passes mer. 9h. 35m.
	—		Saturn passes mer. 0h. 26m.
	—		Georg. passes mer. 1h. 48m.
15			Clock before the ☉ 9m. 5s.
	—		☽ rises Morn.
	—		☽ passes mer. 4h. 4m. M.
	—		☽ sets 9h. 24m. M.
	4	0	☽ in Apogee
	7	10	☿ in the descending node
17	0	39	☽ in □ or last quarter
18	0	35	♄ in conj. with the ☉
	15	45	♃'s first sat. will em.
	19	48	Juno in □ with the ☉
20			Clock before the ☉ 7m. 36s.
	—		☽ rises 4h. 2m. M.
	—		☽ passes mer. 8h. 44m. M.
	—		☽ sets 1h. 31m. A.
	10	13	♃'s first sat. will em.
	14	46	♂ in conj. with the ☽ diff. of dec. 3. 34. S.
21	23	30	☿ in conj. with the ☽ diff. of dec. 2. 0. S.
22	8	53	♃'s fourth sat. will em.
	12	9	☿ greatest elong. 27. 46. W.
	12	30	Pallas in □ with the ☉
23	17	47	♄ in conj. with the ☽ diff. of dec. 0. 35. S.
24	2	6	Ecliptic conj. or ● new moon
25			Clock before the ☉ 6m. 5s.
	—		☽ rises 6h. 32m. M.
	—		☽ passes mer. 0h. 57m. A.
	—		☽ sets 7h. 35m. A.
	5	30	♅ in conj. with the ☽ diff. of dec. 2. 52. N.
	10	58	☿ in Aphelion
26	23		☽ in Perigee
27	2	25	♀ in conj. with the ☽ diff. of dec. 9. 50. N.
	12	8	♃'s first sat. will em.
28			Occul γ Tauri im. 5h. 19m. em. 6h. 29m.
	—		Occul. 71 Tauri, im. 8h. 42m. em. 9h. 15m.
	—		Occul. θ^1 Tauri, im. 9h. 31m. em. 10h. 23m.
	—		Occul. θ^2 Tauri, im. 9h. 31m. em. 10h. 25m.
	—		Occul. 81 Tauri, im. 10h. 30m. em. 10h. 57m.
	—		Occul. 85 Tauri, im. 10h. 48m. em. 11h. 35m.
29	20	26	Ceres in □ with the ☉
	—		Occul. 111 Tauri, im. 7h. 30m. em. 8h. 35m.
	—		Occul. 117 Tauri, im. 9h. 23m em. 10h. 3m.
31	6	58	☽ in □ or first quarter
	8	29	♃'s second sat. will em.
	22	32	♀ greatest hel. lat. N.

J. LEWTHWAITE, Rotherhithe.

THE

LONDON JOURNAL,

AND

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CONJOINED SERIES.

No. CCVIII.

RECENT PATENTS.

To JASPER WHEELER ROGERS, *of Nottingham-street, in the City of Dublin, civil engineer, for certain improved methods and machinery for the preparation of peat as a fuel, and, in combination with certain substances, as a compost or manure.*—[Sealed 1st June, 1848.]

THIS invention refers, firstly, to a series of operations constituting a new system of preparing peat as a fuel, suitable for furnaces and fire-places; which fuel, in a charred state, is particularly applicable to the manufacture of metals for forge-fires, for founder's use in moulding, and for pyrotechnical and other purposes. Secondly, this invention refers to the manufacture from peat of granulated charcoal, and to the admixture thereof with animal excrement, for the purpose of deodorizing the same, and making a diluted inodorous manure.

In Plate VII., the apparatus employed in carrying out the various operations, constituting the new system of preparing peat, is clearly shewn.

Before commencing to cut peat in large quantities from a bog or peat moss, it is first necessary to drain the bog, so that the operation of cutting may be more safely and advantageously carried out; and this the patentee is generally enabled to do, at the time of cutting the peat for manufacturing purposes, without a separate outlay for draining, by proceeding in the following manner.

After having ascertained the level of the bog, so as to find

the natural outfall for the water, the cutting is commenced by taking out blocks of peat, averaging from 4 to 6 inches long by 3 to 4 inches square, which are to be afterwards converted into fuel. The cutting is carried on so as to form a number of trenches of any given length, and as nearly parallel to each other as the position and circumstances of the land will allow, commencing as nearly as possible to the natural outfall. These trenches are formed from 100 to 1000 feet, or more apart, according to the nature and depth of the bog; and, in the first instance, they are made about 4 feet wide and 4 feet deep,—a sufficient fall being given to each drain to run off the water which may drain into the trenches. These trenches having been multiplied, and cut to a length sufficient to drain that portion of the bog which is to be first cleared, the upper crust or surface of the peat moss is removed transversely, for about one-fourth of the space between the trenches, to the depth at first of about two feet; and thus, alternately, the peat is continued to be removed from the trenches in a longitudinal direction, and from the intermediate part of the bog in a transverse direction—each cutting being about two feet deep; by which means the bog is prevented from falling in by lateral pressure; and the drainage of the whole is effected by the terraces or steps, which are thus formed by degrees in the bog, and which provide for the drainage of the water from the general mass. After this process has been carried into effect over the whole surface of the peat moss or bog to be reclaimed, the surface or crust which has been left uncut between the trenches is cut away over the whole extent of the bog under reclamation, commencing at the points nearest to the natural outfall. When the surface or crust has been removed, the second step or terrace is taken away in the same manner, then the third and fourth, until the whole of the peat is removed; and the substratum can be then made fit for cultivation.

Having explained the mode of cutting the peat from the bog, the patentee next proceeds to describe the means employed for drying and preparing the peat.

In the drawings accompanying his specification, the patentee has shewn a portable shed (which is made of wood or wicker work, as most convenient) open at the ends and sides, but having a waterproof covering at top of any convenient flexible material, which also hangs over the side. Into this moveable shed the peat—which is cut from the bog in blocks of a suitable size—is placed, in order that the blocks may be partially dried by the action of the wind. The blocks

are placed, immediately upon being cut from the bog, on trays, which may be made of wood or wire or wicker work, as most convenient; and the trays are piled one above the other in the portable shed, to the sides of which handles are attached for carrying the shed from one place to another, or its bottom framing may be furnished with wheels if thought necessary. The sheds are placed in exposed positions, so that the air may circulate around and through them, and thereby drive off the moisture from the peat. When the peat has been thus exposed for a few days, according to the season and state of the weather, the shed, with its load, is removed to the drying station, where it is unpacked, and the peat is piled up in clamps to receive an artificial drying in the manner now to be explained.

One of the kilns or frames in which the peat is piled up to receive the artificial drying, is shewn in several views in Plate VII. Fig. 1, is a longitudinal elevation, partly in section, the better to shew the interior arrangement; fig. 2, is an end view; fig. 3, is a vertical section, taken in the line 1, 2, of fig. 1; and fig. 4, is a plan view, with a portion of the outer casing removed. This kiln or drying shed is erected over an excavation made in the ground, and forming a continuous ash-pit from one end to the other of the shed. The sides of the pit are secured by brickwork or masonry, and on either side a rail is laid, to form a way for the ready passage over the pit of a series of furnaces or chambers A, A, A, intended to receive the peat which is to be charred, and which, when ignited, gives off heat sufficient to dry the peat piled within the shed. These furnaces or chambers A, are formed of sheet iron or any other suitable material, having a quadrangular framing at bottom, provided with fire-bars, or perforated plates, or other similar contrivances, as may be found most convenient. The sides of these chambers incline inwards pyramidically; but, although square-based chambers or furnaces are preferred, circular-based or conically shaped furnaces will also be found effective. Each chamber is made moveable, by being mounted on wheels or otherwise, so as to be taken out of the air-chamber to admit of the peat being packed in the chamber or furnace, which is done most conveniently by turning it over on its side and packing it through the bottom. These furnaces A, are placed within a space or chamber formed by slanting iron plates B, B, placed immediately over the ash-pit, and forming a continuous air-chamber from one end to the other of the kiln or shed. B*, B*, are doors for closing the ends of the chamber, which must be

of a sufficient capacity to allow of an air space all round each furnace. The plates B, B, are pierced with rows of holes, decreasing gradually in diameter upwards. The fire-boxes are stationed at equal distances apart on the line or tramway, and immediately beneath vertical pipes or funnels C, C, C, attached to the upper part of the chamber formed of the plates B, B. These pipes are intended to receive and surround the several pipes D, D, D, which carry off the smoke and gases from the burning fuel within the fire-boxes. The upper end of each of the pipes C, C, C, is closed, so as to confine the heated air, which would otherwise rapidly pass off; but an opening is made in the cover or closing plate, to allow of the pipes D, D, D, sliding up and down freely in guides provided for that purpose. The object of giving the pipes D, this motion is, that they may be drawn upwards out of the way of the fire-boxes as they are moved into the shed; but when these boxes are arranged in their proper positions, the pipes D, are lowered, so as to fit over the circular opening formed in the top of the fire-boxes, as before mentioned. E, E, E, are beams which form the skeleton of the frame on which the peat is piled. The peat to be dried is piled up on either side of the air-chamber B, B, and to such a height as the shed admits of; and, in order to keep rain or the moist atmosphere from falling upon the peat, and yet allow the wind to act upon it when artificial heat is not being employed, a covering, composed of a series of shutters H, H, H, overlapping each other when closed—somewhat like a Venetian blind—is constructed, which may be readily opened or closed at pleasure. These shutters are made of any convenient length (two, three, or more sets, placed side by side, will be required to cover the whole of one side of a shed), and they are furnished at their ends with pivots, which drop into sockets cut in the sides of the slanting beams E, E, E, as shewn at fig. 3, and support them in their places. *d, d,* are rods which are temporarily connected to the ends of the shutters, and are intended to open and close a series of them simultaneously by the action of a lever *b*; *c, c,* are legs which hang from the under side of the shutters, and lie in a recess cut in the shutters to receive them when the shutters are closed; but when the shutters are opened the legs *c,* keep them in that position, by resting respectively on the shutter immediately below. By this means a sort of ladder is formed up the outer side of the shed, and the workman is thereby greatly facilitated in performing the operation of filling in the peat. In effecting the piling of the peat, he proceeds in the following

manner:—He first covers the floor of the shed and kiln with the blocks, and piles them up as high as he can conveniently reach; he then puts the lowest shutter in its place, by dropping its pivots into the sockets cut in the side framing of the shed, and places a block or blocks *a*, (see fig. 3) under the shutter, to keep it up and form a step; the upper shutters, having legs *c, c*, as before stated, are then applied as required, and form steps for the workman to reach his work with convenience. He then proceeds alternately to pile up the blocks of peat in the shed, and to apply the shutters, until the shed is filled and the shutters are all put in their places. The side rods *d*, for opening and closing the shutters, are then attached, and the artificial drying is ready to be commenced. The ash-pit is entered by the door I; and the peat in the fire-boxes or chambers A, is fired from beneath the fire-bars;—the dampers *d**, situated immediately above the pipes D, being raised by means of their respective rods *e*, to effect a proper draft for ignition, and closed down tightly when the fires are required to be extinguished. As soon as the peat to form the charcoal is fired, care must be taken to regulate the combustion so that it shall proceed slowly, according to the ordinary mode of charcoal burning. This may be readily effected by means of the ash-pit door I, and the dampers *d**, which place the operation completely under the command of the attendant. By referring to the figures, it will be seen, that while the fires are being supplied with air (which passes along the ash-pit and between the fire-bars), the chamber formed by the plates B, B, also receives a supply; and this air, being in contact with the heated surfaces of the fire-boxes and the flues, will become quickly heated and pass off through the holes in the plates B, B, and distribute itself through the mass of piled peat, at the same time the air surrounding the fire-boxes will form a packing, and prevent the peat which is near the fire-boxes from being burnt or injuriously affected by the contiguous fires. When the heated air is distributed through the mass of peat, it will quickly drive off the greater portion of the aqueous particles which remained therein from the first drying operation, and complete the preparation of the peat for domestic or ordinary uses.

In some cases, instead of applying the heat obtained from the burning of charcoal (in the furnaces), the patentee employs a blast of air for drying the peat. For this purpose he mounts a fan-wheel on a shaft, in connexion with the air-chamber B, and drives it with a great velocity,—taking care that there shall be no vent for the wind but through the perforations in the

plates of the air-chamber. The blast will thus be distributed equally through the mass of peat, and drive off the vapour; or, instead thereof, the fan is made an exhausting fan, and a partial vacuum is produced in the chamber B, the effect of which is to induce a current of air to flow through the pile of peat, and the aqueous particles flow into the chamber.

Where large quantities of peat are required to be dried, instead of employing distinct sheds for every pile of peat, a general covering or roof of any given extent is provided (the sides being formed of shutters, acting in the same manner as before described); and beneath this roof the heaps of peat are built up according to the plan above described,—the breadth, length, and heighth of the heaps varying according to the size and number of the furnaces employed.

In the drawings accompanying his specification, the patentee has shewn the arrangement suitable for a large drying-station, wherein are six rows of piled peat, placed side by side, but having a free space all round for the escape of vapour. The fire-chambers, for charring the peat and converting it into fuel, may be either moveable or stationary; but at large drying-stations both plans are preferred to be used, inasmuch as the blast of cold air, or the exhausting mode of drying (which modes may probably be most resorted to when large quantities of peat are not required to be charred), can be best applied to those rows of peat which have the air-chambers cleared of the fire-boxes, whereas the stationary fire-chambers will be less expensive to build, and some will necessarily be continuously in use for preparing the charcoal. In this arrangement the peat is piled upon slanting beds or frames; and thus the air is allowed to circulate under as well as around the peat. The stationary fire-chamber has one flue at its end, and it is filled up with peat by a workman from below, who takes the peat from trucks, pushed forward to him on a rail or tram-road laid down on the bottom of the ash-pit. The fire-bars of the fire-chamber are removeable; the workman inserts first a few fire-bars to form a bed, and then piles the peat thereupon: this he continues until he has nearly filled the chamber; a space being, however, left in the upper part of the chamber, to form a horizontal flue in connexion with the vertical flue, which is provided with a damper to regulate the draft of air to the fire. The complete filling of the chamber (as far as requisite), and the insertion of the remaining bars, may be effected by opening a door in the end of the chamber. From the above description, it will be understood that the drying process under the general roof

is in effect the same as that before described in connexion with the single roof,—the preference of one plan over the other being determined merely by the amount of work required to be done at the drying-station.

It is well known, that for furnaces or enclosed fire-places, where the draft is strong, a greater density of fuel is required than the usual peat charcoal naturally possesses; it is therefore necessary for certain purposes to submit the peat to pressure to consolidate the particles; which consolidation is essential to the production of dense or consolidated charcoal; and this is also particularly necessary when close stowage of fuel is an object, as, for instance, in steam-vessels.

To effect the consolidation of the peat, and consequently of the charcoal, an arrangement of machinery, shewn in side view at fig. 5, is employed. Fig. 6, is a front view of the same, partly in section; fig. 7, is a plan view of the presser; and fig. 8, is a partial section, taken through the line 1, 2, of fig. 5. *a, a,* are cast-iron standards, attached to a bed plate, and forming the main framing of the machine. At the top of the standards a short shaft *b*, is mounted, which carries an oscillating beam *c, c,* in connexion with the piston-rod of the adjacent steam-engine. *d, d,* is a shaft which passes between the standards *a,* at right angles to the shaft *c,* and rests in suitable bearings connected therewith. This shaft at either end supports the wheels *e, e,* which turn loosely thereon, and at their periphery are furnished with a series of radiating rectangular moulds *f*, open at their ends, and intended to receive the peat to be pressed. These wheels are so constructed that they will revolve freely, and yet allow of the side-pieces *g, g,* of the standards projecting out, so as to form a temporary bottom to each mould as it comes, by the revolution of the wheel, over such projecting parts, which on their upper face are slightly curved and fit against the inner end of the moulds. Pendent from the beam *c,* are two plungers *h, h,* which are situated over their respective wheels *e, e,* and are intended, as they are alternately depressed by the oscillation of the beam *c,* to enter the moulds of the wheel *e,* (when they are brought over the projecting pieces *g,* of the standards) and compress the peat which has been previously put into the moulds by hand. To facilitate the entrance of the plungers into the moulds, the upper ends of the moulds are provided with lips, inclining outwards and forming guide-pieces. The plungers *h, h,* are attached to the beam *c,* by pivots which enter slotted bearings, as shewn; and an elasticity is given to the pressure of the plunger by means of a strong spring *i,*

inserted in a recess in the beam *c*, and acting upon the inner end of the plungers. When, therefore, by reason of a piece of peat of an extra size being put into moulds, the plunger would, according to its usual adjustment, impart too great a pressure to the peat, the plunger will rise in its socket, and the compression of the spring *i*, will absorb the extra amount of pressure. In order to give a rotating intermittent motion to the wheels (which is necessary to bring the moulds round and stay their progress while the pressing operation is being performed), the following means are adopted:—In the face of each of the wheels *e*, a zig-zag groove *k*, is formed, as shewn at fig. 5, and in the grooves the pins *l*, respectively work. *m, m*, are pendent rods, jointed to the beam *c*, and receiving a reciprocating motion therefrom. At about the middle of their length they carry the pins *l*, and at their lower ends work respectively through guides or eyes in the ends of the shaft *d*.—*n, n*, are ratchet rings, bolted to the face of the wheels *e*; and a pawl or click *o*, jointed to an arm *p*, which is supported loosely on the shaft *d*, takes into the teeth of each ratchet ring. A coiled spring *q*, forms an elastic connexion between the arm *p*, and the pendent rod *m*, the use of which will be presently understood. Attached to the rod *m*, is a finger *r*, which, as the rod descends by the oscillation of the lever *c*, comes into contact with the arm *p*, and forces it down together with its pawl *o*, which slides over several teeth in the ratchet ring *n*. This movement of the rod *m*, causes the pin *l*, to traverse the radial portion of the zig-zag groove and assume its lowest position; but the same movement of the beam *c*, which brings down the rod *m*, also forces the plunger *h*, into the mould *f*. The rising of the rod *m*, and the plunger will therefore be simultaneous; and, by the connexion of the spring *q*, with the arm *p*, and rod *m*, the wheel *e*, will no sooner be free to move than the click *o*, having an upward impulse from the spring *q*, will push the wheel round sufficiently to bring the next succeeding mould under the plunger; the pin *l*, in the mean time, will traverse the inclined portion of the zig-zag groove, and, when arrived at its highest position, will act as a stop to the further movement of the wheel. In order to effect the operation of pressing the peat with the least possible exertion of power, an exhausting apparatus, acting simultaneously with the pressing apparatus, is employed to draw out the air and any aqueous matter that may yet remain in the peat at the time that the plunger is descending upon the block of peat. It will therefore be understood that the plunger will only have to overcome the resistance

of the bulk of the solid matters, instead of, as heretofore, meeting with the resistance of air and water, which cannot, without great difficulty, be expelled from peat or any other similar mass by pressure. The exhaustion is effected in the following manner:—The parts *g, g,* of the standards are each pierced with channels radiating upwards, and form a pierced bed or bottom for their respective sets of moulds, as the moulds severally come under the plungers. Three channels are connected with a pipe *s*,—one for each bed-piece *g*,—and these pipes lead severally to an exhaust cylinder *t*, (see fig. 8), provided with a valve opening outwards, and also with a piston and piston-rod. The piston-rods of the two cylinders are connected to opposite ends of a rocking-lever *u*, which has its fulcrum on a shaft *v*, and on the same shaft is an arm *w*, (see fig. 6), attached by a connecting-rod *x*, to an arm *y*, on the shaft *b*. When, therefore, the plungers, by the rocking of the beam *c*, on its shaft *b*, are depressed, a corresponding motion will be given to the exhaust pistons, which will draw the air or water from the moulds into the cylinders *t*, and on rising, force it out at the valves thereof. The compression of the fuel will cause it to remain in the moulds after the pressure is withdrawn; the plungers *z*, are therefore provided for clearing out the mould. These plungers are jointed to vibrating levers *z**, on the shaft *v*, and move simultaneously with the piston-rods. They are guided in their vertical motions by their rods forming a link, the straight sides of which work in grooves cut in the boss of the wheel *e*, which boss they embrace. The plungers *z*, are so situated as to act upon the compressed peat in the moulds when the moulds attain their lowest position in their rotation, and the compressed blocks of peat are thrust out of the moulds into baskets placed for their reception.

In order to solidify the dust or small particles of peat-charcoal (which, in the general manufacture, is produced in large quantities), and render it applicable as a fuel, mucilaginous matters, composed of animal or vegetable gluten, albumen, or starch, are intermixed with the dust or small particles, in the proportions of about 2 parts of glutinous or mucilaginous matters to about 8 parts of charcoal. This operation may be advantageously effected by means of an ordinary pug-mill, and by the employment of a moulding machine in connexion therewith, or by panel-moulding. The combined charcoal may be moulded into bricks or cakes, or into forms to resemble wood, which are then dried by any convenient means.

The second head of the invention refers, as before stated,

to the manufacture of granulated peat-charcoal, to be used as a deodorizing agent, and, in combination with certain substances, as a compost or manure.

It is well known that, as a general manure, that which contains the largest amount of ammoniacal salts is the most valuable; but inasmuch as these salts are very volatile, they are generally lost by evaporation, according to the present mode of treating and using, as a manure, animal excrement, which contains these valuable properties in abundance. It is also known that animal excrement cannot be properly used, as a manure, without dilution. Now the patentee has ascertained by many experiments that peat-charcoal possesses considerably greater absorbing powers than the generality of wood-charcoal; and that, by reason of the strong affinity which exists between carbon and ammoniacal and other gases, the odours arising from animal excrement are taken up and destroyed, when contact and intimate admixture with the charcoal takes place.

In manufacturing the peat into granulated charcoal, to be used as an absorbent of the ammoniacal gases arising from animal excrement, and for diluting the same sufficiently to make a useful marketable manure, the patentee proceeds in the manner before described for obtaining peat-charcoal; and, when so obtained, he subjects it to the operation of grinding, until it is reduced to grains about equal in size to those of coarse gunpowder. He then employs it in the following manner:—In order to retain all the volatile products and other fertilizing properties, so as to apply them beneficially to the purposes of agriculture, granulated peat-charcoal is intermixed by hand labour, or by any convenient machine, with animal excrement,—the charcoal being used in such quantities as will be sufficient to absorb the aqueous and volatile products of the excrement and destroy the effluvium. To obtain these results, and prepare a marketable manure of such a strength as will be immediately available for agricultural purposes, there is added to the excrement an amount of peat-charcoal exceeding in weight that of the excrement: thus, two parts, by weight, of charcoal, and one part, by weight, of excrement from towns, will be found to produce an inodorous manure; but the patentee does not confine himself to these proportions, so long as the desired result is obtained by adding an excess, by weight, of peat-charcoal to animal excrement. By this means an apparently dry, powdered, inodorous mixture is obtained, of sufficient strength (or rather dilution) to be advantageously applied, either to arable or

pasture land, and which is capable of transport in barrels or sacks by the ordinary modes of conveyance. To prevent the evils which arise from the odours of animal excrement of towns, the granulated charcoal may be applied to the separate receptacles for such matters, either in the entire quantum required to destroy the effluvium, or in such quantity as will prevent injurious exhalation; and thus render it more convenient for transport to a place where the process of perfect mixing can be conveniently carried into effect.

Peat-charcoal may likewise be advantageously employed as an absorbent of the sewage-water from farm yards and stables, and also as an absorbent of other kinds of liquid manure.

The patentee claims, Firstly,—as respects the drying of peat, the employment of moveable sheds for protecting the trays of cut peat from the weather, and yet allowing a current of air to pass between and over the layers of peat, so as to partially dry the peat before it is removed from the bog lands to the station. Secondly,—the peculiar construction of drying shed above described, with reference to the drawings, for drying peat (whether such shed be made to contain one or more clamps or heaps of piled peat), whereby the peat will be protected from the weather,—the moisture, when driven off from the peat, will be allowed to escape into the atmosphere,—and, when required, air may be allowed to circulate freely around the pile of peat; also the arrangements of fire-chambers (or charcoal-burning chambers) and air-chambers above described, or any analogous arrangements, whereby the heat given off by the charred peat is made available for evaporating the moisture from fresh-cut peat; and further, the use of the perforated chamber B, and fan-wheels, for extracting or evaporating the moisture from piles of peat by exhaustion, or by the application thereto of a blast of air.

And, as respects the manufacture of charcoal, whether for the purpose of fuel or as an ingredient for a manure, the patentee claims the charring of peat in chambers or vessels, as above described, whereby the admission of air thereto, when the combustion of the peat has proceeded to an extent sufficient to produce carbonization, may be readily cut off, and the fire quickly extinguished.

With respect to the machinery for compressing peat-fuel, he claims the arrangement of parts constituting the compressing-machine, as described with reference to the drawings; and particularly the application to such machine of an exhausting apparatus, whereby the extraction of the air and aqueous particles contained in the substance under operation

may be effected simultaneously with the compression of the mass.

And, lastly, as respects the combination of peat-charcoal with certain substances, as a compost or manure, the patentee remarks, that he is aware it has been proposed to mix with earths and a variety of refuse materials, charcoal dust, charred saw-dust, and other analogous vegetable matters, in small quantities; but this has been rather for the economical employment of the charcoal dust and other analogous matters, which would be otherwise useless, than for effecting a defined and previously unattained object. He therefore wishes it to be understood that he lays no claim to the broad principle of employing peat-charcoal as an element in the manufacture of manure; but he claims the application of peat-charcoal (by preference granulated) to animal excrement, in such quantities as shall deodorize the same, by chemically retaining the volatile gases in the manure; and also the admixture of peat-charcoal in such quantities and proportions with animal excrement as shall produce a dry pulverulent manure, suitable, without the addition of other ingredients, for the manuring of arable and meadow land.—[*Inrolled December*, 1848.]

To William Young, *plumber, and* Henry Burgess Young, *engineer, both of Barnstaple, for improvements in smelting and refining lead ores.*—[Sealed 28th August, 1848.]

This invention consists in a mode of condensing and collecting the metallic and other valuable particles that escape from reverberatory and other furnaces used in calcining and "flowing" lead ores, refining lead, reviving litharge, and cleansing slags.

The means by which the patentees carry out their invention are shewn in Plate VIII.; fig. 1, being a sectional plan view of a reverberatory furnace, and parts connected therewith, for condensing the metallic and other particles, and fig. 2, a sectional elevation of part of the condensing-apparatus. *a*, is the furnace; and *b*, is a flue, proceeding therefrom, and containing an exhausting-apparatus *c*, by which the metallic particles, smoke, &c., from the furnace are drawn along the flue *b*, and driven through the tube *d*, into the space between the under side of the plate *e*, and the surface of the water contained in the cistern *f*, when the heavier particles will sink to the bottom of the cistern *f*. The plate *e*, is about six inches smaller in diameter than the cistern *f*, and conse-

quently there is a space of about three inches between the edge of the plate and the sides of the tank. To the edge of the plate *e*, a rim, from six to eight inches deep, is fixed, at right angles to the under surface of the plate; and between this rim and the opening at the centre, where the tube *d*, is attached, a number of rims or plates of the same depth are fixed to the plate *e*. The lower part of all these rims or plates is finely perforated, to the breadth of three or more inches; and these rims are partially immersed in the water contained in the cistern, so that the metallic particles, smoke, &c., will be confined beneath the condensing-cover *e*, until a sufficient pressure is exerted to force the same through the holes or perforations into the chamber *g*. The temperature of the metallic particles, smoke, &c., (thus detained upon the surface of the water, beneath the condensing-cover *e*,) being considerably above the boiling point, steam is constantly generated, and is driven with the metallic particles, smoke, &c., from the chamber *g*, through the flue *h*, and passage *i*, into and through a series of close vaults or chambers *j*, *k*, *l*, *m*, *n*, *o*, *p*, which communicate with each other by means of flues, extending from the upper to the lower part of the walls that divide the chambers: the opening at which the metallic particles, smoke, &c., enter the flue from one chamber is at the top; and the opening by which the same are discharged from the flue into the next chamber is at the lower part of the wall. In each chamber a plate, perforated with small holes, is so placed that the metallic particles, smoke, &c., must pass through the same. From the last chamber *p*, the remainder of the metallic particles, smoke, &c., (if there be any) is discharged through the passage *q*, into the ash-pit of the furnace *a*, where it becomes mixed with the requisite quantity of air to support combustion, and then passing between the fire-bars becomes consumed.

If the amount of steam generated from the water in the cistern *f*, is insufficient to create the requisite draft, an additional quantity may be discharged into any part of the passage *i*, or chambers *j*, *k*, &c., which may be considered most suitable: the boiler for generating the additional quantity of steam is shewn at *r*; and the pipe for introducing the steam into the passage *i*, is marked *s*. In order that the surface of the water in the cistern *f*, may be kept at any desired height above the lower edge of the rims of the condensing-cover, and varied from time to time as circumstances may require, the patentees fix a cistern *t*, outside the chamber *g*, and connect it by a pipe with the lower part of the cistern *f*,

so that the height of the water in the former will indicate the height of the water in the latter cistern. Water is supplied to the cistern *t*, in the usual way; and the surface of the water is raised or lowered by means of a flexible waste-pipe, which is raised or lowered at pleasure, and to which an index is attached, to shew the exact height of the water in the cistern *f*. The constant supply of water is so regulated that the quantity which is converted into steam will be supplied, and a small quantity allowed to flow from the waste-pipe. If the surface of the water be raised, a greater amount of propelling force will be required to drive the metallic particles, &c., through the water into the chambers *j, k, l, m, n, o, p*; and by this means the exhausting power of the apparatus *c*, and consequently the intensity of the fire, may be regulated with the greatest nicety: the patentees do not, however, confine themselves to this mode of producing the desired effect, as the same may be done by causing the water in the cistern to remain at a given height, and raising or lowering the condensing-cover by means of screws or levers.

The patentees conclude their specification by stating, "We do not rest our invention on the particular manufacture of any separate article of which our apparatus is composed, all of which may have been heretofore used for other purposes; but we claim as new and not before made known the combination of such articles and things to the construction of an apparatus which produces the following results:—First,—by means of the water lute, and the regulation thereof by the condensing-cover, or by raising or lowering the water in the cistern, having complete command of the draft from the furnace, by which great saving of fuel is effected. Secondly,—by causing the particles of lead which escape with the smoke from the furnace to be brought first into contact with a large body of water, then to be forced through a number of plates, finely perforated with holes, into numerous vaults filled with steam, causing, by the divisibility of the atoms of such metallic particles and smoke, and its coming in contact with such water and steam, a greater specific gravity, and therefore its deposit in some or one of the said chambers or vaults; —thereby effecting a saving in the smelting of ores of these metallic particles which, by the ordinary flue or stack, passes into the atmosphere. Thirdly,—by the means aforesaid, manufacturing, in the smelting of lead, valuable white and blue oxide of lead, in very fine paste or powder. And, Fourthly,—by causing the air, smoke, and remaining particles of metal, if any, to be brought to discharge itself, by means of the

power of the draft and the application of steam from the apparatus, through the fire of the furnace, and thus, in continued succession, ensuring the most effectual means of saving all the particles of metals in the process of smelting, and the preventing smoke and other nuisance by the ordinary mode of smelting ores."—[*Inrolled February,* 1849.]

To JOHN LEWIS RICARDO, *of Lowndes-square, in the county of Middlesex, Esq., M.P., for improvements in electric telegraphs, and in apparatus connected therewith.*—[Sealed 4th September, 1848.]

THE first part of this invention consists in a mode of enclosing two or more wires together in gutta-percha or compounds of gutta-percha, for electro-telegraphic purposes, in such manner as to insulate the wires from each other and from external matters.

The patentee states, that it has been before proposed to insulate single wires for electric telegraphs by covering them with gutta-percha or gutta-percha combined with other materials; and it has also been proposed to enclose several wires in gutta-percha, but by very different means to those which he has invented. In Plate VIII., fig. 1, exhibits a transverse section of six wires, covered and combined together by means of two fillets of gutta-percha or a compound of gutta-percha and other substances. It will be seen that between every two adjacent wires there is a groove in each side of the combined or adhering fillets of gutta-percha, produced by such parts being pressed more closely than the other parts of the fillets, in order to render the insulation perfect; and, for the purpose of securely closing the external edges of the fillets, a solid bead is formed at each edge. Instead of using gutta-percha alone, the patentee prefers to combine it with gum-cowrie or New Zealand gum and flowers or milk of sulphur, in the proportion of eight parts, by weight, of gutta-percha to one part of gum-cowrie or New Zealand gum, and one part of flowers or milk of sulphur.

The patentee encloses the six wires (or any other number) in two fillets of gutta-percha or compounds thereof, in a like manner to what *single* wires have before been covered for the Electric Telegraph Company. For this purpose, he employs a pair of grooved rollers, heated by steam; the projecting edges, between the grooves of these rollers, do not work in contact, so as to separate or cut the fillets, but are at such a distance

apart that they simply press the two fillets more closely together at the parts which come between the wires; and there are two grooves on each roller more than there are wires to be enclosed, for the purpose of forming the solid bead at each edge of the combined fillets. The wires to be covered are wound on reels, from which they are conducted through suitable guides to and between the grooved rollers, and the ends are attached to a roller that is acted on by a weighted cord, so as to wind up the fillet containing the wires as fast as such fillet is delivered by the grooved rollers. In order that the surfaces of the two fillets which are to be joined together may be adhesive, they are heated by passing over and under boxes or surfaces heated by steam or other means; and, if necessary, the under fillet is supported, to prevent it from breaking or elongating when heated.

The second part of this invention consists in a mode of forming instruments for suspending the wires of electric telegraphs. Fig. 2, is an elevation, fig. 3, a vertical section, and fig. 4, a view of the under side of an instrument made of earthenware or other non-conducting material. *a*, is the central part of the instrument, within which is fixed the hook whereby the wire is suspended; and so long as this part *a*, is kept dry the wire will remain in a state of insulation. Between the part *a*, and the rim *b*, there is a space *c*, which acts as a "throat," to prevent any water that may fall on the outside of the instrument from passing up the interior of the rim *b*, so as to come to the part *a*; and it is the making of the space *c*, around the part *a*, and within the part *b*, which constitutes the novelty of this part of the invention.

The patentee claims, Firstly,—the mode of combining two or more wires for electro-telegraphic purposes by enclosing them between two fillets of gutta-percha or compounds containing that material, in such manner as to insulate one wire from the other or others and from external matters. Secondly,—the construction of the apparatus described for suspending wires for electric telegraphs.—[*Inrolled March*, 1849.]

To Samuel Lees, *of the firm of Hannah Lees and Sons, of Park Bridge, in the county of Lancaster, iron manufacturer, for his invention of certain improvements in the manufacture of malleable iron.*—[Sealed 8th August, 1848.]

This invention relates, firstly, to the method of forming or constructing the pile or fagot of which the bar is made pre-

vious to its being welded and rolled or otherwise finished, and is applicable to the manufacture of most descriptions of malleable iron, such as hammered and rolled iron of various forms, round, square, and flat bar iron, fluted roller iron (particularly such as is used in the machinery employed in the cotton and other similar manufactures), polygon bars, angle-iron, T-iron, railway tyres, rails for railways, and axles (solid or hollow), tubular bar iron, and any description of malleable iron, where quality and strength combined are required. The ordinary method of forming the pile or fagot is by placing horizontally, one above the other, several plates, or, as they are technically termed, flat bars; and it must be evident that a shaft or bar formed from such a pile or fagot will be of unequal strength, and liable to split or laminate in different directions.

The improved method of forming or constructing the exterior or casing of the pile or fagot is by employing plates of iron placed at right angles to each other, and dove-tailed or so formed as to overlap each other at the angles;—the interior being filled with the best scrap iron, or bars or plates placed either horizontally or vertically or at right angles to each other, and either overlapped or dovetailed or not, as may be considered most suitable for the purpose to which the iron is ultimately to be applied.

The second part of the invention applies to the rolling-mill in which the plates or bars (for constructing the above-mentioned pile or fagot) are formed, and also for rolling the bars constructed from such a fagot to the size and form required.

The improvement in the method of rolling the plates or bars, which is also applicable to rolling any form of iron having grooves or hollows on its face, consists in the application of a suitably formed bar or mould to the framing of the rolling-mill, so as to preserve the form of the groove or hollow whilst the bar is passed through the rollers on its edge; and the improvement in the method of rolling the bars, constructed from such a fagot, consists in the employment of two sets of rollers, placed side by side, and revolving in different directions, so that the bar may be passed backwards or forwards without the necessity of lifting it over the rollers.

The third part of the invention applies to the method of straightening the bars after they have been rolled, and consists in placing them upon a plate of iron or other suitable level surface, and fastening the two ends by means of clamps or otherwise whilst the bar is in a heated state, so that, in

cooling, the bar, by its own contraction, assumes a straight line.

In Plate VIII., fig. 1, is a diagram (being a sectional or end view), representing the ordinary method of piling or fagotting plates or flat bars for forming a railway-bar or rail; and fig. 2, shews a section of a rail, formed from such a fagot;—the dotted lines of this and the other figures shewing the direction in which the grain of the iron is laid, from which it appears that, in consequence of the plates being simply laid one over the other, the surface of the rail is liable to laminate or split off in layers when in use, and also that the grain of the iron forming the "tree" or upright part of the rail is laid in the wrong direction for strength. In order to obviate these imperfections, the patentee constructs the pile or fagot, from which such bars are to be made, as represented at fig. 3, which shews the exterior of the fagot as composed of four plates *a, a,* dove-tailed at the angles; the upper and lower plates, which are to form the heads of the rail, are made of greater strength than the sides, for the purpose of forming a solid working-surface; and the bars *b, b,* composing the tree of the rail, are placed in a vertical position,—thus rendering the bar much stronger. Fig. 4, shews a section of a rail constructed from such a fagot. Fig. 5, shews the ordinary method of piling or fagotting flat bars or plates for forming round shafts (as piston-rods) or axles, &c.; and fig. 6, is a section of a shaft or axle formed from such a fagot, by which it will be seen that the joints of the plates run parallel across the shaft, causing it to be of unequal strength on its different sides, and, when turned, to be liable to shew black streaks along the shaft, which is a very great objection. In order to remedy this evil, the pile or fagot is formed as represented at fig. 7. Fig. 8, is a section of a round bar or shaft formed from such a fagot, which will be found to be composed of as many hoops or tubes as there are casings in the fagot; and in consequence of the overlapping of the joints the bar will be of greater strength, having no straight joint running throughout its length, which is of great importance. Fig. 9, is a diagram, representing an improved method of piling a fagot for forming a railway tyre-bar; and fig. 10, is a section of a tyre-bar formed from such a fagot. The bar *a,* which ultimately forms the working-surface of the wheel, is stronger than the others; and the bars *b, b,* being placed vertically throws the resistance of the sides of the bar in the proper direction. Fig. 11, shews the method of constructing a fagot

for forming a hollow or tubular bar or shaft. If the interior of the shaft or tube should be required to be of larger diameter, the pieces *a, a,* forming the tubular core, must be removed, the under casing *b, b,* dispensed with, and a larger core substituted. Fig. 12, shews a fagot for forming round, square, polygon, flat, angle, T, and other bars, which is composed of five dove-tailed casings, placed around a square bar. Fig. 13, is a modification of the same,—the exterior casing *a, a,* only being dove-tailed, and the interior casings having the joints crossed at the angles as at *b, b.* Fig. 14, shews an ordinary fagot or pile, enclosed in a dove-tailed casing. Fig. 15, represents a pile or fagot suitable for the best turning-iron, for making fluted or other rollers, such as those used in preparing and spinning machinery employed in cotton and other such manufactures, and is formed by placing the dove-tailed plates *a, a,* together and filling the centre *b,* with the best scrap-iron. Figs. 16, and 17, are modifications of the arrangement shewn in fig. 13,—the outside plates in the latter being overlapped as shewn at *a, a, a,* instead of being dove-tailed.

The improved rolling-mill is shewn in side elevation at fig. 18, and in end elevation at fig. 19. *a, a,* is the framing of the apparatus, and *b, b,* the main driving-shaft, to which motion is to be communicated from the engine or other driving power in any convenient manner. Upon this shaft *b,* a spur-wheel *c,* is keyed, for the purpose of driving a spur-wheel *d,* which communicates motion to the rollers *e, e,* in the usual manner. These rollers are suitably formed for imparting the requisite form and dimensions to the plate or bar. The bar is first passed through the rollers 1, 1, (fig. 18,) and afterwards turned upon its edge and passed between the rollers 2, 2; the bar or mould *f,* preserving the form of the groove or indentation produced in the surface of the bar by the rollers 1, 1: after passing between the rollers 2, 2, the bar is sufficiently reduced in width to pass between the rollers 3, 3, and subsequently through the rollers 4, 5, and 6. It will be evident that the rollers *e, e,* may be removed and others substituted for them, according to the form of the plate or bar to be produced, and also that the bar or mould *f,* may be changed, so as to suit the form of the groove or indentation made by the rollers 1, 1. Suppose a square bar to have been made from the above plates, and fagotted as described in the first part of this specification, it is to be then welded, rolled out, and finished by passing it alternately backwards and forwards between the rollers *g, g,*

and *h, h*. It will be seen that the rollers *g, g*, are coupled to the rollers *e, e*, and consequently revolve in the same direction; but the rollers *h, h*, are caused to revolve in the reverse direction by the following means:—The spur-pinion *c*, upon the main driving-shaft, actuates another spur-pinion *i*, keyed upon the longitudinal shaft *k*, upon the other end of which is fixed the spur-pinion *l*, driving a spur-wheel *m*, to which the rollers *h, h*, are coupled. Supposing these rollers *g, g*, and *h, h*, to be revolving in opposite directions, the bar is first passed between the rollers 7, and then back again through the next pair of rollers, and afterwards between each succeeding pair of rollers. The carriage *n, n*, to which the rod *o*, for supporting the bar, is attached, is caused to traverse backwards and forwards along the rails *p, p*, as required, in the following manner:—To the spur-wheel *d*, is attached a grooved pulley *q*, driving, by means of a band, the pulley *r*, fixed upon one end of the shaft *s*. Upon the other end of this shaft *s*, is a mitre-wheel *t*, driving a similar wheel *u*, keyed upon the stud that carries the friction-roller *v*. There are two smaller friction-rollers *w*, and *x*, (see the plan view fig. 20,) mounted upon a frame *z*, which swivels upon a centre at 1. Between the rollers *v, w*, and *x*, pass thin plates or rails 2, 3, attached to the carriage *n, n*. When the carriage is required to traverse either in one direction or the other, the handle 4, must be moved, so as to cause either the roller *w*, or *x*, to press the rail 2, or 3, against the roller *w*; and as this roller is constantly revolving the carriage will thus be caused to traverse in the direction required.

The patentee claims, Firstly,—the methods of forming the outside of a pile or fagot by placing plates or flat bars of iron together at right angles (the plates being dove-tailed or overlapped at the corners), whether the interior is filled with scrap-iron or with plates laid horizontally one above the other or at right angles to each other, and either dove-tailed or overlapped at the angles or not. Secondly,—with respect to the rolling-mill, he claims the use of the bar or mould *f*, for preserving the form of the groove or indentation whilst the bar is being passed through the rollers on its edge. Thirdly,—the method of driving the rollers *g*, and *h*, in opposite directions, as above described. Fourthly,—the method of actuating and reversing the carriage *n, n*. And Lastly,—the method of straightening bars of iron by confining their extremities whilst in a heated state, and then causing them to assume a straight line by their own contraction in cooling.—[*Inrolled February*, 1849.]

To Richard Shaw, *of Gold's Green, West Bromwich, Staffordshire, railway-bar finisher, for improvements in the manufacture of iron into tyre-bars, round bars, square bars, and flat bars,* T-*iron, angle-iron, and trough-iron.*— [Sealed 21st August, 1848.]

This invention relates, firstly, to improvements in the manufacture of tyre-bars for railway wheels; secondly, to improvements in the manufacture of round bars, square bars, and flat bars; thirdly, to improvements in the manufacture of T-iron; and fourthly, to improvements in the manufacture of angle-iron and trough-iron. All these improvements consist in certain modes of constructing the piles from which such classes of iron are rolled, so as to prevent the iron from laminating outwards, as is the case when the piles are constructed in the ordinary manner by placing several plates parallel to each other; and there will be less lamination outward in such classes of iron, when made according to this invention, than when what are called box-piles are used.

When tyre-bars are rolled from piles of iron composed of flat layers, placed one upon another, or from box-piles, in which the layers that compose the sides of the piles are placed in a vertical position to the top and bottom layers, it is found that the top and bottom layers of the piles laminate to and shew joints on the sides of the bars. Now, in the manufacture of tyre-bars for railway wheels, it is requisite that no "edgings out" of the layers of the pile should be found in the flange or on the sides of the tyre; for, when this is the case, there is danger of the layers separating when the wheel is in use; and the object of the patentee is to remedy this imperfection in the manufacture of tyre-bars.

In Plate VII., fig. 1, is a transverse section of a pile suitable for rolling into a tyre-bar, such as is shewn in section at fig. 2: in this arrangement the plate *a*, (which will constitute the working face) is bent so that the grain of the iron will not laminate out at the sides of the tyre-bar. The interior construction of the pile may be varied, so long as means are adopted for preventing the lamination. Fig. 3, is a modification of the pile shewn at fig. 1: the bar made from this pile would differ from that represented at fig. 2, only in the points indicated by the dotted lines *b, b*.

In manufacturing flat bars, round bars, and square bars, the patentee makes hollow shapes or forms of iron, by bending plates or flat bars, and uses them in the formation

of piles; the object being to bring the laminæ of the iron in the pile to correspond and run even with the shape of the bar into which it is to be rolled, instead of the layers laminating to the sides, as heretofore. When piles made in the ordinary manner, of flat plates or layers, have been rolled into round, square, and flat bars, it is found that the several plates or layers laminate to the sides of the bars and shew their edges and joints, which is injurious to the strength and appearance of the bars; and this is what the patentee endeavours to obviate by having as few joints on the sides of the bar as possible, and by causing the layers to run even with the form of the bar. Fig. 4, is a section of a pile made in the ordinary manner with flat plates; and figs. 5, exhibit a round bar and a square bar rolled therefrom. Figs. 6, and 7, are sections of two piles constructed according to this invention, with bent plates, in such manner that there are only two joints on the outer surface. Figs. 8, shew the sections of the bars rolled from the pile fig. 6; and figs. 9, exhibit the bars produced from the pile fig. 7. The interior structure of these piles may be varied according to the judgment of the operator. The patentee prefers to use "three-high" rolls (*i. e.*, three rolls working in concert in the same vertical plane) for rolling the iron of which the piles are to be formed.

The patentee makes T-iron by forming the piles in the way shewn at fig. 10, and then rolling the same into bars of the section represented at fig. 11. For angle-iron and trough-iron, the piles are made as shewn at fig. 12, and are rolled into bars of the sections exhibited at figs. 13, and 13*. Fig. 14, is a section of a bar rolled from the pile shewn at fig. 6.

The patentee does not confine himself to the exact details above given. He states that, in making railway-bars, he has before used piles having a like character to those above described;—the internal arrangement of such piles having been varied by placing intermediate plates of iron between the curved bars, in a vertical or horizontal position, as deemed most suitable for the various sections of railway-bars which have been manufactured from this kind of piles. He does not, therefore, claim the use of such description of piles generally under this patent, but only the application of such principle of constructing piles in the manufacture of the classes of iron above described.—[*Inrolled February*, 1849.]

To George Price Simcox, *of Kidderminster, in the county of Worcester, carpet and rug manufacturer, for improvements in the manufacture of carpets and other similar articles.*—[Sealed 16th November, 1847.]

This invention consists in various improved modes of producing carpets and other similar fabrics, whereby they may be made more durable and at the same time much cheaper than by the process now in ordinary use. The improvements may be divided into two general heads: the first refers to the production of fabrics of great durability, some of which are similar in appearance to ordinary Brussels carpets; and the second relates to the manufacture of fabrics with a cut pile, such as Wilton or Axminster carpets. In the manufacture of all the different kinds of fabrics according to this invention, the patentee dispenses with the use of Jacquard apparatus, and also with the employment of the iron wires or tags, which are ordinarily employed to produce terry fabrics, such as Brussels carpets and coach lace. By the suppression of these parts of ordinary carpet looms the machinery is rendered much more simple, and can consequently be worked at greater speed, and the fabric produced at much less expense than by the usual process.

The first part of the invention consists in making a ribbed fabric, greatly resembling the ordinary Brussels carpet fabric, by a combination of woollen and linen warp and weft, arranged in such a manner that the woollen warp, in the form of a ribbed surface, may constitute the face of the fabric, while the linen warp forms the ground or back of the fabric.

Diagrams of four different plans for producing these fabrics are shewn in Plate IX., at figs. 1, 2, 3, and 4. The letters *a*, *b*, *c*, *d*, *e*, and *f*, denote the woollen and linen warp threads; the letters w, and L, the woollen and linen weft threads; and the numbers 1st, 2nd, 3rd, 4th, &c., denote the stages of the operation of weaving,—shewing the number, arrangement, and mode of working the healds and throwing in the linen or woollen shoots or wefts. The plan which produces a fabric most closely resembling Brussels carpet is shewn at fig. 1, and it consists in weaving the fabric as nearly as possible in the ordinary way, except that, instead of inserting a tag or wire to form the rib or terry, the patentee throws in a thick shoot or weft of woollen or cotton, over which the woollen warp is drawn and forms a rib; the woollen warp being afterwards bound down with a linen shoot or weft in the ordinary way: the mode of producing this fabric will,

perhaps, be best understood by referring to the sectional diagram A, which shews the arrangement of woollen and linen warps and wefts. The woollen warp employed being all of one color, the fabric produced will be plain or unornamented, with a looped or terry pile; and upon this fabric any design may be printed, by blocks or otherwise, according to any of the well-known processes.

A fabric somewhat different in appearance and character from that above described, but answering the same purposes, may be produced in a loom of similar construction, by altering the arrangement and operation of the healds or headles which work the warps. In the former case only four healds were required; but as the fabric now alluded to is a species of twilled fabric, six healds must be employed, as indicated at fig. 2. Instead of all the woollen warp being made to rise and fall together, only one-third of the woollen warp goes down at one time, viz., every third shoot: each warp thread therefore, in regular succession, extends over three weft threads, so as to produce the appearance which is called twill. A sectional diagram of the mode of producing this fabric is seen at B.

In the two fabrics above described, the woollen warp threads alone, although somewhat differently arranged, constitute the face of the fabric, and as the weft threads are scarcely seen, these threads may be made to consist of linen or cotton in place of wool; but a very good appearance may be produced by employing a much less quantity of woollen warp and allowing the woollen weft threads to appear on the surface of the fabric. Linen and woollen shoots must be employed in this as in the former instances, and various means may be suggested for effecting the intended object: two plans are shewn at figs. 3, and 4, in both of which four healds only are employed, namely, two for the woollen warp and two for the linen. In fig. 3, each alternate woollen warp thread is made to pass over and under each weft thread, and is also bound in by the linen weft below, as seen in sectional diagram C; but in fig. 4, each alternate warp thread is made to pass over and hold two woollen weft threads, and is itself held down by the linen weft (as seen in the sectional diagram D,), but never passes under the woollen weft, which, as in the former case, forms part of the face of the fabric. The looms in which these are made do not differ very widely in construction from those usually employed for producing various other fabrics; the principal difference consisting in the employment of two separate shuttles, one for the woollen

weft and one for the linen weft. These shuttles are both thrown by the same pickers and picking-sticks; and consequently the shuttle-boxes must be moved up or down as may be required, in order to allow the picker to throw the proper shuttle. It will also be necessary to work the healds in a suitable manner to form the proper sheds, in order that the woollen face may be properly bound to the linen ground.

Fig. 5, represents a perspective view of the working parts of a loom (divested of the framing), suitable for making the fabrics above-mentioned. A, is the work-roller; B, the linen warp-roller; C, the worsted warp-roller; D, the dead-roller, over which the worsted warp passes before passing through the headles; and E, the cap of the lathe or slay. The healds or headles are marked with the same letters of reference *a, b, c, d, e, f,* as the woollen and linen warp threads (shewn at figs. 1, 2, 3, and 4,) on which they act. The following is a description of the operation of the headles and shuttles when manufacturing the above fabrics; reference being had to the diagrams, figs. 1, 2, 3, and 4; as, by an attentive examination of these diagrams and the accompanying explanation, any practical weaver will be able with facility to arrange the loom for producing any of the before-mentioned fabrics:—Fig. 1, represents the mode of working the healds and shuttles for producing the fabric in imitation of Brussels carpet, a diagram section of which is seen at A. To make this fabric only four healds are required. The line *a,* represents the worsted warp, the line *b,* the linen or cotton stuffing warp, and the lines *c,* and *d,* the linen warp or ground chain. The warps are supposed to be in the position ready to begin work (that is, with the woollen warp *a,* up, as marked at 1st operation, with a circle in the diagram), and the shuttles must be so arranged as to throw the woollen shoot or weft first, as marked W, in the diagram. 2. When this is beaten up (which operation of course takes place every time either shuttle is thrown) the headle, with part of the linen warp *c,* is drawn up, *a,* having been taken down, and then the linen shoot L, is thrown in in the direction of the arrows. 3. The headle *c,* then goes down and *a, b,* and *d,* come up, and the linen shoot L, is thrown back. 4. Then the headle *a,* is drawn up and *b, c,* and *d,* taken down, and the woollen shoot W, returns. 5. Then the linen warp *d,* is drawn up, *a, b,* and *c,* being down, and the linen shoot L, is again thrown. 6. *a, b,* and *c,* are raised, *d,* being taken down, and the linen shoot L, is thrown in the opposite direction. This completes the course of operations, which are continually repeated in the same order.

In the diagram, fig. 2, there are six healds, as shewn in the perspective view, fig. 5, as this fabric, which is represented in the sectional diagram B, requires six healds to produce it. In this case there are three woollen healds *a, b,* and *c,* and three linen ones *d, e,* and *f.* The healds are represented in the diagram at operation 1st and in the perspective view as ready to commence work: that is, with the three woollen healds up and the three linen ones down,—thereby separating the two materials comprising the fabric from one another. 1. The woollen shoot is thrown in and beaten up. 2. Then the healds *a, b,* and *f,* are drawn up, *c, d,* and *e,* being down, and a linen shoot L, is thrown. 3. Then the healds *a, b, c, d,* and *e,* are drawn up, *f,* being down, and the linen shoot L, is thrown back again in the opposite direction, as shewn by the arrow. 4. Then *a, b, c,* are drawn up and *d, e, f,* taken down, and the woollen shoot thrown a second time. 5. The healds *b, c, d,* are drawn up and *a, e, f,* taken down, and the linen shoot L, thrown. 6. The headles *a, b, c, e, f,* are up and *d,* is down, and the linen shoot L, is thrown back again. 7. Then, as at the commencement, *a, b, c,* are up and *d, e, f,* down, and another woollen shoot is thrown in. 8. *a, c, e,* are up and *b, d, f,* down, and the woollen shuttle is thrown. 9. *a, b, c, d, f,* are up and *e,* is down, and the linen shoot is thrown back again, which completes the course.

In order to produce the fabric shewn at fig. 3, the shuttles are arranged in the same manner as in the former instance; but only four healds are required, namely, two worsted or woollen *a, b,* and two linen *c, d.* The 1st operation is to draw up half the woollen warp as *a,* and throw in the woollen weft or shoot. 2. Bring up the other half *b,* of the woollen warp and *d,* of the linen warp, and throw the shoot L. 3. Draw up healds *a, b, c,*—the other one *d,* being down; and throw the linen shoot L, back again. 4. Draw up *b,*—*a, c, d,* being down; and throw the woollen weft W, again. 5. Draw up *a, c,*—*b, d,* being down; and throw the linen weft L. 6. Raise *a, b,* and *d,* and carry down *c*; then throw the linen weft back again, and the fabric is completed, as shewn in the sectional diagram C.

The fabric shewn in the sectional diagram D, is somewhat similar in appearance to the one just described. It is made by a similar arrangement of shuttles and the same number of healds. The explanation of the diagram, fig. 4, is as follows:— 1. The worsted or woollen warp *a, b,* is drawn up, the linen warp *c, d,* carried down, and the woollen shoot W, thrown. 2. The healds *b, d,* are drawn up and *a, c,* taken down, and

the linen shoot is then thrown. 3. The healds *a, b, c,* are raised and *d,* lowered, and the linen weft or shoot returned. 4. The woollen warp *a, b,* as at first, is drawn up and the linen one *c, d,* carried down; and the woollen shoot is again thrown. 5. Then the healds *a, c,* are raised and *b, d,* taken down, and the linen shoot is thrown. 6. The healds *a, b, d,* are raised,—*c,* being down; and the linen shoot is thrown back again: thus the course is completed. These fabrics may be made either in a hand or power-loom.

The second part of this invention relates to the production of fabrics with a cut pile, or such as are known as Wilton or Axminster carpets or rugs. The ordinary mode of making some of these fabrics is to weave the pattern in by means of a Jacquard apparatus, and pass the woollen warp over a rod or tag, which is afterwards cut out by passing a suitable knife along it, thereby producing the cut pile. In manufacturing rugs the process is still more tedious and costly, as the pattern-threads are put in by hand. This mode of making cut pile and other carpets, or similar fabrics, has however been much simplified by the employment of a printed warp, which, when woven over wires, and the surface afterwards cut, produces a fabric with an ornamental design, scarcely if at all inferior in appearance to that produced by the old but more tedious process. The object of this part of the invention is to produce a similar fabric, but in a different, improved, and more economical manner; as a loom, constructed according to these improvements, can be driven by power; for the patentee altogether dispenses with the use not only of the Jacquard apparatus but also of the wires or tags to form the pile. By the improved plan, the pattern or design and surface of the fabric is produced from the weft, in place of the warp, as heretofore. For this purpose the weft is made to consist of thick woollen shoots, which must be printed or stained with suitable colors, precisely as the woollen warps have been heretofore done; and the woollen shoot, when thrown in, is, by means of suitably-formed hooks, pulled up and formed into loops, which, when they are properly secured to the foundation or ground of the fabric, are afterwards cut by means of knives or cutting instruments, with which the hooks are furnished, for the purpose of releasing them from the loops and producing the cut pile.

Fig. 6, represents a front view of that part of a loom with which the improvements are connected; and fig. 7, is a vertical section of the same. *a, a,* is the framework of the loom; *b, b,* the batten, lathe, or slay; *c, c,* the double shuttle-

boxes; and *d, d,* the shuttles, one of which is furnished with a woollen weft or shoot to form the pile, and the other with a linen one to form the ground. *e,* is the main or driving-shaft, the cranks of which are connected to the batten or lathe by means of connecting-rods or straps *f, f.* Upon the driving-shaft *e,* is mounted a small toothed wheel *g,* which gears into and drives another toothed wheel *h,* mounted on the shaft *i,* and twice the size of the smaller wheel *g.* On the shaft *i,* are also mounted two other wheels *j, j*,* with teeth around a portion only of their circumference, which are intended, at proper intervals, to take into the teeth of the small wheels *k, k*,* mounted on the horizontal shaft *l*: it will be seen, by referring to fig. 7, that the wheels *k, k*,* like those marked *j, j*,* are only furnished with teeth around a portion of their circumference. On the shaft *l,* are likewise mounted two large pulleys *m, n,* connected, by cords *p, q,* to a roller *o,* denominated the lifting-roller; and the cords or ropes *p, q,* are guided and kept in the proper positions by the loose pulleys *r, r, r, r.* A horizontal bar or rail *s,* extends across the front of the machine, for the lifting-roller *o,* to run upon; and a round rod or bar *t,* also extends across the front of the loom, for the purpose of guiding the lifting-roller *o,* in its proper course, and preventing it from running off the rail *s.*—*u, u, u, u,* are a series of hooks, shewn detached and upon an enlarged scale at figs. 8, 9, and 10. These hooks are furnished with knives or cutting blades *u*,* and are placed in front of the batten *b.* The lower ends of the hooks *u,* are passed down between the warp-threads *v,* just in front of the work, and enter notches cut in the lower horizontal beam of the batten *b.* The upper ends of these hooks are slotted, and are suspended from a rod *w,* which is passed through the slots for the purpose. This rod *w,* rests upon the horizontal bar *w*,* which, as well as another horizontal bar w^1, below, is notched, so as to form comb-bars, and serve to guide the hooks *u,* as they rise and fall, and thus to keep them in their proper positions.

The operation of the loom is as follows:—The shed having been formed, in the ordinary way, by means of the healds—the shuttle containing the linen weft thrown across—and the cranked shaft *e,* made to revolve in the direction of the arrow—the batten or lathe will beat up the linen shoot that has just been thrown; and another shed of the warps must be formed, and the shuttle containing the worsted shoot thrown. The hooks *u,* which, during the last beat-up of the linen shoot, were resting upon the bar w^1, as shewn at figs. 9, and 10,

are now caused to drop down between the warp-threads into the position shewn at figs. 6, and 7, and a short beat-up of the batten takes place, which must be just sufficient to place the worsted shoot on the lower end or hooked part of the hooks *u, u*; then the hooks are to be drawn up, one after another, by means of the lifting-roller *o*, in the manner hereafter described; and the woollen weft will, by this operation, be pulled up into loops, as shewn in the enlarged detached views, figs. 8, and 9.

The hooks *u, u*, are raised, as before stated, by the lifting-roller *o*, which is made to travel across the machine by communicating motion to the large wheels *j, j**, upon the shaft *i*, by means of the toothed wheels *g*, and *h*; and as the wheels *j, j**, take alternately into the teeth of the small wheels *k, k**, on the shaft *l*, immediately after every throw of the worsted shoot, and thereby cause them, with the pulleys *m*, or *n*, to revolve rapidly, the lifting-roller *o*, will, by means of the cords *p*, or *q*, be made to fly along the bar *s*, in front of the loom, and act against the under sides of the horizontal projections 1, of the upper parts of the hooks *u, u*, and raise them; and as the hooks are raised they are forced forward by the springs *x*, and made to catch or lodge upon the bar w^1, where they remain suspended until they are removed by the lathe in the manner to be described. It should be understood that the shaft *l*, is fixed and does not revolve, and that the wheels and pulleys *k*, and *m*, and *k**, and *n*, are mounted on hollow shafts, which revolve loosely upon the shaft *l*, and consequently independent of each other; so that when the teeth of the wheel *j*, for instance, have worked out of gear, or passed the teeth of the small wheel *k*, and brought the lifting-roller *o*, across the loom, as in fig. 6, the cord attached to the other pulley *n*, will cause that pulley to revolve and bring the teeth of the wheel *k**, into a position to be acted upon by the wheel *j**, as it comes round, which will be the case immediately after the next woollen shoot is thrown and laid upon the hooks *u, u*, ready to be raised and formed into loops. While the hooks *u, u*, have hold of the loops of the woollen weft, and the hooks are suspended from the bar w^1, the shed is again changed, and a shoot of linen is thrown, which, when closely beaten up, will bind and secure the woollen or worsted weft in its looped position, leaving it ready to be cut or opened by the knives or cutting instruments of the hooks *u, u*. This cutting or opening of the loops is effected in the following manner:—To the swords of the batten *b*, is affixed a horizontal cross-piece *y*, the under side of which is bevilled; and

this piece *y*, when the batten *b*, beats up, comes into contact with and presses down a lever *z*, connected to the knife of the hooks *u*, *u*, as seen in fig. 10, thereby causing the blades or knives u^*, u^*, to rise and cut through the weft and open the loops, to form the face of the fabrics—and, as the batten *b*, recedes, the edge of the piece *y*, catches in a notch in the ends of the levers *z*, of the hooks *u*, and draws them forward off the bar w^1, when they will fall down by their own weight into the position shewn at figs. 6, and 7, ready to receive the next shoot of worsted, as before.

It has been stated that when the worsted shoot is thrown a short beat-up of the batten is necessary, for the purpose of placing it on the hooks, so that it may be drawn up by them to form the loops: this is effected by the following contrivance:—Upon the shaft *i*, (see figs. 6, and 7,) are placed two cams 2, and 3; these cams, as the shafts *i*, revolve, depress the levers 4, and 5; which levers, by means of the rods 6, and 7, lower the pins of the connecting-rods *f*, *f*, and cause them to slide down the curved slots in the lower ends of the swords of the batten; and by this means the beat-up of the batten is shortened.

It will be evident to any intelligent mechanic that the above arrangement may be variously modified and a like result obtained; for instance, the hooks may be constructed and worked in a different manner to that shewn. The patentee describes a modification of the above arrangement, in which the knife or moveable blade of the hook *u*, is dispensed with, and instead thereof the lower end or hooked part of the hook *u*, is made with a knife edge, for the purpose of cutting the loop; and the hooks are kept in their proper positions by comb-bars w^*, and w^1, and a rod *w*, as before: the rod *w*, however, is not fixed but is pressed against the upper ends of the hooks by springs. Instead of the small lifting-roller *o*, there is a large cam-wheel *m*, (see fig. 11,) mounted on a shaft *n*, and actuated by the chain o^*, which is driven by a small pulley on the end of the driving-shaft *e*; and, as the cam-wheel revolves, the cams or steps *p*, of the wheel *m*, come successively in contact with the short ends of a series of horizontal levers *q*, *q*, and, by depressing these levers, thereby raise the hooks *u*, *u*, (to which they are connected) a sufficient height to form the loops and hold them in that position, while the linen or binding shoot is being thrown in and beaten up; by which time a second cam or projection on the cam-wheel *m*, comes round and further depresses the short arms of the horizontal levers *q*, *q*, and thereby suddenly raises the hooks *u*, *u*, a

further distance to cut open the loops and release the hooks. After the fabric is removed from the loom, it will be advisable to shear the surface, in order to render it perfectly even. This operation may be effected in any ordinary shearing-machine.

The patentee observes, that although he has generally described woollen and linen warp and weft as the materials to be used in the production of the above described fabrics, yet he does not intend to confine himself exclusively to these materials, as cotton and other cheap materials may be employed with great advantage in the production of some of the fabrics; nor does he intend to confine himself rigidly to the precise arrangement of the threads of which these fabrics are composed, as various arrangements or patterns may be devised by any practical weaver, and made to produce similar fabrics, having a woollen or cotton face and a linen ground; neither does he intend to confine himself rigidly to the peculiar construction of parts set forth and described, as all these points may be varied without departing from the nature and object of his invention.

He claims, First,—the production of a fabric in imitation of Brussels carpet, such as that described at diagrams figs. 1, and A, with a linen or cotton ground and a ribbed surface, consisting of woollen or cotton warp, with a woollen or cotton stuffing-shoot to form the rib. Secondly,—the various fabrics described in reference to diagrams, figs. 2, 3, and 4, and B, C, and D, or any mere modifications thereof, in which there is a strong linen or other ground combined with a woollen or cotton surface, which may be ornamented by printing or otherwise. Thirdly,—making a cut-pile fabric by drawing up the weft or shoot, either plain or printed, by means of hooks or other similar instruments, which are afterwards made to cut the loops, thus formed, and produce a cut-pile.—[*Inrolled May,* 1848.]

To WILLIAM ECCLES, *of Walton-le-Dale, in the parish of Blackburn and county of Lancaster, and* HENRY BRIERLY, *formerly of the same place, but now residing at Chorley, in the said county of Lancaster, for improved machinery to be used in spinning.*—[Sealed 2nd March, 1847.]

THIS invention has reference to the machine called the "mule," used chiefly in spinning cotton, and the object is to obtain an improved method of producing several movements which are

to be used in rendering the machine self-acting or capable of working without the interposition of manual labour. The following description will explain the different movements referred to:—First, the movement termed "backing-off" or reversing the motion of the spindles, so as to uncoil the yarn to a certain extent from them, and allow the descent of that part of the machine called the "faller," previously to winding the yarn upon the cop. In order to obtain this movement of the spindles, a band or chain is attached to the carriage, and connected with certain wheels and pulleys, and made to operate upon the pulleys which drive the spindles through the medium of toothed gearing, one part of which is held fast by a break or friction-pulley, while the carriage is moved a few inches backwards, and thus causes the band or chain abovementioned to turn a drum, wheel, or pulley, over which it passes, and, by means of the other part of the toothed gear referred to, communicate a reverse motion to the spindle,—the faller descending at the same time down an inclined plane, fixed for the purpose.

In Plate IX., fig. 1, is a side view of part of the head-stock of a mule, shewing the manner of arranging the parts in order to produce this effect. A, A, is the head-stock of the mule; B, B, are the pulleys used for driving the spindles through the medium of the band *b*; C, is one of the twist-pulleys, from which the band *c*, proceeds for driving the drums and spindles, in the usual manner; and D, indicates the pulleys round which the drum bands pass, inside the carriage, in the same manner as in the hand-mule. Attached to the front of the carriage E, (shewn in section,) is a band or chain F, which, as the carriage runs out during the operation of spinning, is wound upon a pulley or drum H, which is mounted upon the same shaft as the pulleys B, and C,—the pulley or drum H, being loose thereon, while the aforesaid pulleys are fast: this arrangement admits of the pulleys B, C, revolving, to drive the spindles, while the wheel or drum H, is stationary or moves slowly in either direction. In order to wind the chain F, upon the drum H, another band or chain G, is used, which coils upon the drum in the contrary direction to the chain F, so that while the carriage runs forward the chain G, winds off the drum, and the chain F, winds on;—the chain G, passing from the lower side of the pulley or drum H, round a carrier-pulley at the back of the head-stock, and being attached to the back of the carriage, as shewn at *x*. An alternate movement of the drum H, is thus produced during the alternate motion of the carriage backwards and forwards. To enable

the drum and chain to effect the operation of backing-off, an arrangement of toothed gearing is employed, as shewn at I, K. Fig. 2, will shew more distinctly the arrangement of these wheels. H, represents a section of the drum; I, K, are the wheels, denoted by similar letters in fig. 1; and P, is a third bevil-wheel, in gear with the wheel K, and made fast to its shaft,—the wheel I, and the drum H, being loose upon the same shaft. There is a friction-pulley N, attached to the wheel I, by means of the boss or nave of the latter wheel being extended through the bearing which supports the shaft Q, and the pulley N, being fixed thereupon. After the carriage has run out, and the yarn has been sufficiently twisted, the break S, is, by a certain movement of the machine, pressed upon the friction-pulley N, whereby the wheels, which were revolving by the movement of the shaft and pulleys B, C, and the wheel P, are caused to stop, and, through the medium of the latter wheel, the shaft and spindles are stopped also. The carriage then begins to move inwards, and the break still remains in contact, holding fast the wheel I. The drum H, is made to turn round for a certain distance, by a given length of the chain F, being unwound from it, and the wheel K, is thus turned by contact with the wheel I, which is now held fast, as aforesaid; the wheel K, being carried round with the drum, and turning upon its own centre at the same time. The wheel P, being in gear with the wheel K, is turned also, and consequently the shaft and pulleys B, C, and likewise the bands and spindles connected therewith. But the motion of the latter is in the contrary direction to that in which they were driven by the action of the machine in spinning. The action of the wheels will also communicate double the quantity of motion to the shaft and pulleys B, C, to that received by the drum H, as the wheel K, turning upon its own centre, and being carried round with the drum, at the same time, will cause the wheel P, to make twice the number of revolutions that are made by the drum. The size of the drum H, must be in proportion to the size of the twist-pulleys which turn the spindles, and to the number of the revolutions which the spindles are required to make in backing-off. When the drum and pulleys are so arranged as to produce one turn of the spindle for every inch receded by the carriage, such proportion will be found adapted for general working. In order to press the break S, upon the friction-pulley N, a spiral spring *a*, is used, one end of which is connected to the upper end of the lever Z, and the other end attached to the headstock, as shewn at *g*. While the machine is performing the

operation of spinning, the spring is prevented from acting upon the break, by means of the stop or stud *d*, upon the rod *m*, which holds back the lever z, in the position shewn in the figure,—the rod *m*, being kept in its place by the catch *e*. When the carriage has run out, and the operation of spinning the stretch is completed, a small shaft, called the twist-shaft, well known in the hand mule, is made to disengage the catch *e*; and the rod *m*, is then made to pass towards the back of the head-stock, by means of the weighted-lever *f*, changing the driving-strap of the machine from the fast pulley to that in connection with the part used for drawing up the carriage. The lever z, which before the disengagement of the catch *e*, was held back by the stop *d*, is now, by the movement of the rod *m*, set at liberty; and the spring *a*, immediately collapses, and draws the upper end of the lever z, towards *g*, thereby pressing the break s, upon the friction-pulley N, through the medium of the part X, and the latch W, operating upon the stud *h*. When the carriage has receded so far as to reverse the spindle sufficiently, the latch W, is disengaged from the stud *h*, by means of the catch *p*, which is attached to the carriage, operating upon the piece *r*, to which is connected the rod *s*, at one end, while the other end of the rod is attached to the latch W. The catch *p*, is so formed as to pass over the piece *r*, when the carriage is running out,—the bevilled end of the catch rising over the said piece without producing any effect; but as the carriage returns, in running-in, the catch moves the upper end of the piece *r*, backward,—thus drawing the latch W, off the stud *h*. The break then drops out of contact with the pulley N, and rests upon the set-screw *t*, placed for the purpose. The backing-off is thus effected, and during the same operation the faller descends down the incline M, placed for the purpose; the counter-faller is also disengaged by the same movement, so as to keep the yarn tight; and the machine is then in a situation for commencing the operation of winding-on. There is an adjusting screw at *v*, and a moveable nut thereupon, which supports the catch *p*; so that the screw being turned at each successive stretch, by means of a small wheel, or in any other convenient manner, will cause the catch *p*, to come sooner in contact with the piece *r*, and thus diminish the quantity of backing-off: which diminution will be required as the cop fills upon the spindle. When the carriage has nearly completed the running-in, a stop or bracket, attached to the carriage, is made to come in contact with the lower end of the lever *f*, and, by pressing forward that end of the lever, to replace the lever and rod *m*, in the position shewn

in the figure; when it will be ready for again coming into operation at the succeeding stretch. The mode of running in the carriage, of letting down the faller by means of an inclined plane M, fig. 1, and of liberating the counter-faller at the same time, are the same as are shewn in the specification of a patent, granted to the present patentees, 5th August, 1845; but the arrangement of wheels and chains, here shewn, may either be used in combination with the parts there described or separately. Instead of three bevil-wheels, four spur-wheels may also be used; two of which, connected to the same axis, will be carried along with the drum H; the other two answering in place of the wheels I, and P.

Second, in performing the operation termed "winding-on" or coiling the yarn, when spun, upon the spindle, in the form denominated a "cop." In effecting this object, and more especially in making such an arrangement of parts as may easily be applied to the ordinary hand-mule, the following method is adopted:—Fig. 3, A, A, represents the ground plan of the middle part of a mule-carriage, shewing the centre-pulleys H, H, and the arrangement of the bands for driving the drums by means of the pulleys G. B, C, represents a lever, having a projecting part D. The end B, of the lever is furnished with a stud, which works into a grooved piece of metal, attached to the lower side of the carriage; so that, as the carriage moves alternately outwards and inwards, the end B, of the lever describes the arc B, *b*; the end C, of the lever being the fulcrum thereof, and turning upon a stud fixed to the floor, or in any other convenient manner. There is a screw attached to the lever, having a nut upon it, to which a chain is connected, which passes between guide-pulleys, as at E, and is coiled upon the drum F, while the carriage is running out, by means of the smaller drum and chain *f*; the latter chain passing to the back part of the machine, and over a pulley, having a weight attached, by means of which the chain attached to the lever and drum F, is kept tight. When the formation of the cop is commencing, the nut to which the winding-on chain is connected, is at the end B, of the lever; and as the carriage runs inwards, after the first stretch, a length of chain is uncoiled from the drum F, nearly equal to the distance moved through by the carriage, and is made to operate upon the spindles by means of the catch or clutch-box, shewn upon the same shaft as the drum F. There is a pair of spur-wheels at *k*, the upper of which is upon the twist-pulley shaft, and the lower one upon the shaft of the winding-on drum; and after the operation of backing-off has been

performed, the part *l*, of the catch-box is geared into the part *i*, which is attached to the winding-on drum; the drum being loose upon the shaft. The part *l*, slides upon a key in the shaft of the drum F, and when geared, the chain being uncoiled from the drum by the running-in of the carriage, causes the drum to turn both the wheels *k*, and through them the twist pulleys G, from which proceed the bands *g*, for turning the drums and spindles. The size of the drum F, and of the winding-on wheels and twist-pulleys must be so arranged as to communicate to the spindles the proper number of revolutions for taking up the yarn, when commencing the cop; an allowance being made for the gain in the number of revolutions which is caused by the drum-bands *g*, proceeding in the direction shewn by the dart, while the carriage is receding the contrary way. The screw, attached to the lever B, C, proceeds from the end B, to near the fulcrum; and upon this screw is a moveable nut K, to which the winding-on chain is connected, as aforesaid. As the cop increases in diameter the screw is turned, so as to bring the nut nearer to the fulcrum of the lever, so that a less arc is then described by it during the running-in of the carriage than when at the end B. The revolutions of the spindles are thus reduced in accordance with the increased diameter of the cop; and this alteration continues progressively until the cop has attained the full diameter; after which the nut remains stationary, or nearly so, until the cop is finished. In the projecting part D, of the lever, is a groove, in which is a stud, which may be placed nearer to or farther from the lever. The use of this stud is to cause a greater variation in the action of the winding-on drum than could be produced by the lever alone; as, when the carriage has receded to a certain distance, in winding-on, this stud comes into contact with the winding-on chain, and thus draws off more chain from the drum F, than would otherwise have been effected, and thereby causes the spindles to make more revolutions when the carriage is near the termination of the running-in. An inspection of the figure will illustrate this,—as suppose the nut to be upon the screw at *x*, then the arc, described by the point of attachment of the winding-on chain, during the running-in of the carriage, will be denoted by *x*, *y*; producing scarcely any movement of the drum F, until the carriage has receded some distance; but that movement gradually increasing, and more so when the stud Z, comes in contact with the chain, and draws it into the position denoted by *x*, *z*, *e*: the speed of the spindles will thus gradually increase as the carriage runs

in, according to the conical shape of the cop. The difference of speed will be greater or less as the stud z, is placed further or nearer in the grooved projection of the lever. The length of the lever and its projection, the quantity of the arc described by it, and the mode of placing the different parts, and their dimensions, will vary with circumstances, as the distance described by the carriage in its alternate movements, and the size of cop required, must be arranged accordingly. At the end of the screw next the fulcrum of the lever is placed a small bevil-wheel, which gears into a larger bevil-wheel *c*,—the latter wheel having its centre upon the same stud as the lever,—so that, by turning the wheel *c*, the screw may readily be made to traverse the nut upon it. The wheel *c*, may be operated upon in a similar manner to those described in the specification of the patent before referred to, or in any other manner which may seem most convenient.—[*Inrolled August*, 1847.]

To Robert Walter Winfield, *of Birmingham, in the county of Warwick, merchant and manufacturer, and* John Ward, *of Birmingham, aforesaid, a workman in the employ of the said Robert Walter Winfield, for improvements in the manufacture of tubes, and in the manufacture of certain articles made in part of tubes.*—[Sealed 14th September, 1848.]

The first part of this invention consists in a method of manufacturing taper tubes of metal or metallic alloys: which method is not only applicable to the manufacture of tubes with straight sides, as shewn in Plate VIII., at fig. 1, but also to the manufacture of tubes with curved sides, as shewn at figs. 2, and 3; and it is likewise applicable to the manufacture of fluted tubes,—whether the flutes are convex or concave, and are parallel to the axis of the tube, as represented at fig. 4, or are twisted, as shewn at fig. 5.

The manufacture of the taper tubes is conducted in the following manner:—The patentees take a mandril, of a figure similar to that which the tube is intended to receive when manufactured, and upon it they place a sheet of metal, cut to the proper size, and bent and soldered, so as to have the form of a taper tube. They draw this roughly-formed tube upon the mandril in the same manner as ordinary cylindrical tubes are drawn, except that, instead of drawing the tube through a draw-plate (or plate of metal formed with a hole of the size of

the intended tube, and which hole is supposed not to enlarge during the process of drawing), they draw the tube through a ring or mould of some soft metal (tin, for instance); the internal diameter of which ring or mould is, at the beginning of the process of the same size as the small end of the taper tube; but by the operation of drawing the tube, supported on its mandril, through the said ring or mould, the latter is caused to expand, and form, as it were, an expanding draw-plate, which exerts sufficient pressure upon the partly-formed tube to force it into close contact with the mandril, and also to draw or elongate the tube. By forming the expanding rings or moulds of different metals or other yielding materials, and by using rings or moulds of different thicknesses, the pressure may be varied to any desired extent. Fig. 6, is a front view, and fig. 7, is a longitudinal section, of an expanding mould for making taper tubes of a fluted form.

The drawing machinery, used in carrying out this part of the invention, differs from that ordinarily employed, only in the use of an expanding ring or mould, and in the following respect, viz.:—in forming tubes which have a twisted figure (such as that exhibited at fig. 5,) it is necessary to communicate rotary motion to the mandril and tube, or to the expanding mould. The patentees prefer to give a rotary motion to the mandril and tube: this they effect by making the mandril to turn loosely on an axis (marked *a*, in fig. 8, which is a longitudinal section of a mandril) and causing the forceps, which are ordinarily made to grasp the tag or waste piece on the end of the tube, to take hold of the end of the said axis, and thereby allow the mandril and tube to rotate while the axis remains stationary. Other modes of using the expanding ring or mould may be adopted: for example, the mandril and tube may be stationary and the expanding mould drawn upon the same; or, when twisted tubes are to be made, the expanding mould may be caused to revolve and the mandril and tube remain stationary.

The second part of this invention consists in manufacturing double tubes of brass for gas fittings, whereby not only are they made stronger, but any leakage is prevented, as if there should be a defect or hole in one it will be covered or closed by the other tube. The two tubes are formed separately; and then one is placed inside the other; and the combined tubes are drawn through a draw-plate, so as to bring them into close contact.

The patentees claim,—Firstly, the manufacturing of taper tubes by pressing a roughly-formed taper tube into contact

with a mandril in its interior,—the said pressure being exerted by a ring or mould; which said ring or mould is made of a material which will yield or expand as the said tube is drawn through it, but which exerts sufficient pressure to force the partially-formed tube into contact with the mandril: whether the said expanding ring or mould be of the form and used in the manner hereinbefore described, or have a different form or be differently used; and whether the said taper tubes have any of the forms hereinbefore described and represented in the accompanying drawings, or have any other form. Secondly, the manufacturing of gas-fittings of double tubes, as hereinbefore described.—[*Inrolled March,* 1849.]

To WILLIAM WHELDON, *engineer to Messrs. John Warner and Sons, of Jewin-crescent, in the City of London, brass-founders and engineers, for improvements in pumps or machinery for raising or forcing fluids.*—[Sealed 4th September, 1848.]

THIS invention relates to those pumps which are worked by lever handles; and consists in causing the axes of such lever handles to be carried by rocking or vibrating standards, which are mounted on axes situated below the axes of the lever handles.

In Plate VIII., fig. 1, exhibits the application of this invention to a lift-pump, suitable for being affixed to a plank: in this pump the axis of the rocking or vibrating standard is carried by the pump-barrel; but this axis may be carried by the plank. *a*, is the rocking-standard; *b*, is its axis; *c*, is the lever handle of the pump; *d*, is the axis of the same, supported by the upper end of the standard *a*; and *e*, is the rod attached to the piston or plunger of the pump. Fig. 2, represents a force-pump constructed according to this invention. Fig. 3, shews an arrangement of parts to be adopted when the piston is worked by a rod sliding in sockets or guides; the axis of the rocking-standard being carried by some convenient surface above the pump-barrel. In all these cases the object is to obtain a rectilinear motion of the piston-rod by causing the axis of the lever handle to move to and fro, by the use of the rocking or vibrating standard, which is situated below such lever handle, and carries the axis thereof.

The patentee claims the mounting of the axes of lever handles of pumps in the upper parts of vibrating or rocking

standards; the vibrating or rocking standards having their axes of motion below the axes of motion of the lever pump handles.—[*Inrolled March,* 1849.]

To PETER WRIGHT, *of Dudley, in the county of Worcester, vice and anvil manufacturer, for his invention of certain improvements in the manufacture of vice-boxes, and in the machinery for effecting the same.*—[Sealed 31st August, 1848.]

THIS invention consists, first, in making the boxes of those vices technically called "standing-vices," or such as are generally used by smiths and engineers, of wrought-iron, either by forging, stamping, or otherwise; and in cutting the worms or female screws in the said wrought-iron boxes out of the solid metal; the object being to give greater strength and durability to the worm, as, by this means, it forms part and parcel of the box itself. In some cases, where stationary boxes are required, the eye of the vice is lengthened by welding thereto a piece or pieces of iron; so that the eye itself forms part of the box, in place of making the box separate from the vice, as is usually done; and the worm or screw is cut out of the solid metal, as in the former instance.

The invention relates, secondly, to an improved machine or apparatus for cutting the worms or female screws of vice-boxes out of the solid iron, as above mentioned.

In Plate VIII. several views of vice-boxes, constructed upon this improved plan, are shewn: the improved machine by means of which the worms of the boxes are cut out of the solid is also shewn. Fig. 1, represents, in side elevation, a vice with one of the improved boxes adapted thereto. Fig. 2, shews, in longitudinal section, one of the boxes detached, with the worm cut therein out of the solid. And fig. 3, represents, in section, the upper part of a vice, in which the box is stationary and forms a fixed part of one of the chops of the vice. The vice-box is formed in the rough by stamping, forging, or otherwise,—an internal cylindrical space being left to cut the worm in by a subsequent operation. As this cylindrical hole may not be made perfectly true, the patentee prefers to place the box in a boring-machine or lathe, for the purpose of boring it out true, previous to having the worm cut therein. Having done this, and bored the hole perfectly cylindrical, he places the box in the machine shewn in the drawings at fig. 4, and proceeds to cut the worm or screw

therein, as will be hereafter explained. It should be observed, that the box is, by preference, made with both ends open, as shewn by dots in fig. 2, and that the outer or lower end (as shewn in the drawing) is not to be closed until after the operations of boring and cutting the worm or screw are completed; but when these operations are finished the larger end may be closed by fixing a plug therein.

Fig. 4, represents a front elevation of the machine employed to cut the worms or screws in the boxes. This machine consists of a cast-iron frame-plate A, A, secured in any convenient and suitable manner in a vertical position,—as, for instance, against a wall. To this plate A, are attached, by nuts and bolts, a series of bearings *a*, *b*, *c*, and *d*, for the purpose of supporting the various working parts of the machine. The bearings *b*, *b*, are secured to the frame-plate A, by screw-bolts, and support the drill-stock *f*, *f*, *f*; in the lower end of which the holder *g*, of the cutting tool or instrument is secured, by a cotter, as shewn in the drawing at I. The bearing *a*, is attached to a large cast-iron plate B, B, which is moveable at pleasure, and may be adjusted to, and secured at, any suitable height in the machine, by means of the screw-bolts, which can be moved up and down in the slots *h*, *h*, as will be well understood by inspecting the drawing. The vice-box to be operated upon is secured in the bearing *a*, of plate B, as seen at C, in the figure,—the lower end of the vice-box being open, to allow the lower end of the holder *g*, of the cutting instrument to pass through and turn in another adjustable bearing *c*, below. This bearing *c*, may also be moved up and down in the slots *h*, *h*, and can be secured at any suitable height, by passing screw-bolts through the said slots. The object of this bearing *c*, and the prolongation of the stock or holder *g*, of the cutting instrument, is to give steadiness to the latter while cutting. The upper end of the drill-stock carries a screw *e*, which is secured therein by means of a cotter, or in any other convenient manner, and passes through a female screw in the topmost bearing *d*. The object of the screw *e*, is to communicate a gradual and regular descending motion to the cutting tool or instrument at the same time that it is caused to rotate by means of the driving gear; and for this purpose the drill-stock *f*, is furnished with a long feather or rib *i*, *i*, which passes through the horizontal bevil-wheel *j*, *j*, and acts as a clutch, whereby the drill-stock, with its cutting tool, is caused to rotate with the wheel *j*, as the latter is driven round by the

bevil-wheel *k*, on the driving-shaft *l*. The stock or holder *g*, of the cutting tool is shewn detached and in section at fig. 5. It consists of a cylindrical rod or shaft, with a long slot or groove formed therein, for the purpose of receiving the steel cutter *m*, which is mounted on a pivot at about the middle, in such a manner that the cutting point may project beyond the slot of the cylindrical shaft *g*. Near the upper end of this cutting tool is a ring *n*, (figs. 4, and 5,) which carries two adjusting-screws *o, o*, whereby the lower or cutting point of the tool may be projected more or less outward as circumstances may require. The cylindrical part *g*, of the instrument is made to fit the hole in the vice-box c; and as the lower end of the instrument *g*, turns in the bearing *c*, it is kept perfectly steady. When the cutting operation is being performed, a small stream of water from a cistern *p*, is supplied to the interior of the vice-box, by a pipe *q*, for the purpose of reducing the friction and keeping the point of the cutter cool. This water ultimately escapes from the lower and open end of the vice-box and falls into the reservoir *r*, below. It will be clearly understood, by inspecting the drawing, that the pitch of the worm to be cut in the box will be regulated by the screw *e*, at the upper end of the stock; and as this screw may be removed and replaced by another of different pitch, so may vice-boxes, with worms of any suitable pitch, be made in this machine by merely changing this regulating-screw. In operating with this machine it is first necessary to secure the vice-box c, in its bearing, and adjust the point of the cutting tool, so that it only projects but a very short distance from the slot in the cylindrical holder *g*; then, upon communicating motion from any prime mover to the large band-wheel or pulley *t*, on the driving-shaft *l*, the cutting tool *m*, will be made to rotate and gradually cut a spiral shaving out of the box under operation. The pulley *t*, is kept in motion until the cutting tool reaches the bottom of the vice-box, or to that part to which the worm is intended to extend,—the machine is then stopped, and the cutting tool and its holder *g*, is run up again to its original position, by communicating motion in the opposite direction to the small pulley *s*, on the driving-shaft *l*; and when the point of the cutting tool *m*, leaves the upper end of the vice-box, the adjusting-screws *o, o*, are turned, so as to cause the cutting tool to project a little further from the holder *g*; and then, upon again putting the pulley *t*, in motion, the cutter will descend and take another spiral shaving off the inside of the

box: these operations are continued until a worm of suitable depth is cut in the box; and, when this has been done, the box is removed from the machine and a fresh one secured in the bearings in its place.

The patentee claims, Firstly,—making the boxes of vices of wrought-iron, and cutting the worms or screws therein out of the solid metal, instead of brazing, welding, or otherwise securing therein a worm or screw separately made, as has usually been the case. And, Secondly,—the machine herein shewn and described, or any mere modification thereof, for cutting worms or screws in the interior of boxes or cylinders.—[*Inrolled February*, 1849.]

To Henry Smith, *of Vulcan Works, West Bromwich, for improvements in the manufacture of railway wheels.*—[Sealed 5th September, 1848.]

This invention consists in forging railway wheels on a succession of anvils, by the employment of hammers of a corresponding character to the anvils,—such wheels being solid, without spokes; but the invention is also applicable to forging the naves and parts of the spokes of railway wheels from a mass of iron, by using anvils and hammers with suitable working faces.

In Plate VII., fig. 1, is a vertical section and fig. 2, a plan view of an anvil, which is to receive a circular slab of wrought-iron, in a heated state, suitable for being forged into a shape approaching that of the desired wheel; or, in place of a circular slab, it might be a mass of scrap-iron or a pile or mass of wrought-iron; and the same is to be well hammered with the hammer represented, in vertical section, at fig. 3, by which means it will be forged into the shape exhibited at fig. 4. The iron is then to be heated again, and placed upon the "roughing-out" anvil (shewn in elevation at fig. 5, and in plan view at fig. 6,) and subjected to the action of the "roughing-out" hammer (represented in elevation at fig. 7, and in plan view at fig. 8,);—the workman turning the heated iron progressively round on the anvil, so that the circular character of the wheel will be preserved by the hammer striking successively in different parts of the iron: the iron is to be re-heated as often as may be found necessary, which will generally be from two to three times during the roughing-out process. The roughly-formed wheel is now to be heated

again, and placed upon the finishing anvil (represented in vertical section at fig. 9, and in plan view at fig. 10,) and submitted to the action of the finishing hammer (shewn in vertical section at fig. 11, and in plan view at fig. 12,); but the heat is not required to be so great as when the iron is undergoing the "roughing-out" operation,—for in this process a planishing or finishing heat is all that is necessary. The roughing-out tools having brought the wheel into the shape represented at fig. 13, the planishing or obtaining of a finished surface is effected by repeated hammering between the finishing tools; the workman turning the wheel round on the anvil so as to bring all parts of the wheel under the hammer. The finished wheel is shewn, partly in section, at fig. 14.

It will be evident, from the above description, that, by using anvils and hammers with working faces having a space between corresponding with the section of the wheel to be produced, a mass of iron, suitably heated, will be forged into a complete wheel; and it is the constructing and using of anvils and hammers, forming, as it were, dies or parts of dies, which constitutes the pecularity of this invention. The anvils are fixed in blocks, and the hammers are worked in the ordinary manner of forge-hammers, or in the same way as the steam-hammers now in use.

When the nave and parts of the spokes of a railway wheel are to be forged out of a mass of iron, according to this invention, such mass is first worked under the hammer, so as to draw out portions for forming the nave and spokes; and then the mass of iron is subjected, in a heated state, to the action of a hammer and anvil made in the character of dies, the working faces of which exhibit the appearance represented at fig. 15. By this means, the mass of iron, which has been partially drawn into shape under an ordinary hammer, will, by the action of the tools or forging-dies, be brought into more correct form for the centre and parts of the spokes of a wheel; and the wheel will then have to be finished by welding thereon parts of spokes, and turning the outer or running surface, and facing the nave in a lathe.

The patentee claims the forging of railway wheels, by employing forging-dies or tools (termed by the patentee anvils and hammers), which have working faces to produce the shapes desired, as above described.—[*Inrolled March*, 1849.]

To William Edward Newton, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in the construction of stoves, grates, furnaces, or fire-places, for various useful purposes,—being a communication.*—[Sealed 6th July, 1848.]

These improvements in the construction of stoves, grates, furnaces, or fire-places, for various useful purposes, are shewn in several views in Plate VII. Fig. 1, is an elevation of a close stove on the improved plan; fig. 2, is a vertical section thereof; and fig. 3, is a horizontal section of the same, taken at the line 1, 2, of fig. 2. Fig. 4, is a vertical section of an open grate, adapted to the improved method of managing combustion; and fig. 5, is a horizontal section of the same, taken at the line 3, 4, of fig. 4. Fig. 6, is a vertical section of a cooking-stove or range, with the improvements applied to it; and fig. 7, is a sectional plan of the same.

The first part of this invention consists in combining the chamber of combustion, in which fuel of any desired kind is burned, with a drum or chamber, for the combustion and circulation of the inflammable matter evolved from the combustion of the fuel, by means of what is termed a throat, through which the products of combustion pass to be inflamed in the said throat and drum.

The second part of the invention consists in admitting a jet or jets of atmospheric air (which may, if desired, be mixed with steam) to the throat which forms the communication between the chamber of combustion and the drum or heating-chamber, that the inflammable gases evolved from the combustion of the fuel in the fire-chamber may be mingled with the atmospheric air, &c., in their passage through the throat, and be thereby inflamed, and pass, in an inflamed and inflaming state, into the drum or heating-chamber; this secondary combustion, as it may be termed, giving a direct course to the flame from the throat, that it may circulate in the drum or heating-chamber, and give out heat, and at the same time prevent the flame from taking a direct course from the throat to the discharge-pipe.

The third part of the invention consists in making the lower aperture of the throat larger than the upper aperture thereof, that the inflammable gases and atmospheric air may be the better commingled in their passage through the throat, and thereby ensure a more perfect combustion.

And the last part of the invention consists in making the throat with an enlargement between the lower and upper

apertures, that the gases which enter the throat from the chamber of combustion may have room to mingle with the supply of atmospheric air before they pass up and out of the smaller aperture above the drum or heating-chamber.

In figs. 1, 2, and 3, *a, a,* represents the hollow base of a stove; on the top plate of which is placed the grate *b*. Upon this grate the vertical fire-pot *c, c,* made of metal or some refractory earthen substance, is placed; the capacity of which is to be determined by the quantity of fuel it is intended to contain. This fire-pot is surrounded by a casing *d, d*; the back of which is semi-cylindrical,—its sides *e, e,* being tangential thereto, and extending to and uniting at front with the outer radiating-cylinder *f, f, f*. The casing *d,* thus forms an air-chamber *g, g,* around the fire-pot; and into it air is admitted through holes in front, governed by a register *h,* to regulate the supply of air which, in passing through this chamber, is highly heated by the fire-pot and the surrounding casing, which receives its heat in the manner to be presently described. A tube *i, i,* extends from the radiating-cylinder to the fire-pot, through which the fuel is supplied; and it is provided with a door *j,* in the usual manner. The air-chamber which surrounds the fire-pot is covered over in part by a cap-plate *k, k,* leaving an annular opening extending all around the upper end of the fire-pot; and to this is fitted the larger end of a funnel-shaped tube *l, l,* called the throat, attached, about the middle of its length, to the cap-plate *m, m,* of the radiating-cylinder; and to the upper surface of this plate is fitted a cylindrical drum *n, n,*—into which the smaller end of the throat opens. The upper end of the fire-pot, in this arrangement, constitutes the larger aperture of the throat, as the upper end of the throat is of less diameter than the upper end of the fire-pot. At the back of the throat the cap-plate *k,* is provided with a vertical pipe *o, o,* which extends down some distance into the radiating-cylinder, which is provided with an exit-pipe *p,* leading to the chimney, for carrying off the products of the final combustion. The gases evolved from the combustion of the fuel in the fire-pot or chamber of combustion pass up into the throat, and there mingle with the heated atmospheric air from the chamber surrounding the fire-pot; and in passing through the upper aperture of the throat, which is contracted, the inflammable gases and atmospheric air are caused to commingle thoroughly and to flame. While burning they pass up into the drum and wards the top thereof, and then descend, giving out heat to entire surface of the drum: the products of this com-

bustion then descend through the pipe *o*, into the radiating-cylinder and out through the exit-pipe *p*, to the chimney; the circulation of the heated products of combustion giving out heat to the radiating cylinder, and to the casing that surrounds the fire-pot, to aid in heating the air which passes through this chamber to supply the combustion of the inflammable gases in the throat and drum. The top plate of the radiating cylinder, to which the throat is attached, and which constitutes a diaphragm to divide the drum from the space between the radiating cylinder and the air-chamber, may be dispensed with, in whole or in part; thus constituting the space within the radiating cylinder a part of the drum, or rather a continuation thereof;—in which case the throat must be attached to the casing that surrounds the fire-pot.

The application of the principles of the invention to open fire-grates is represented at figs. 4, and 5. In this arrangement the air-chamber *g*, only extends around the back and sides of the grate,—the air being admitted through holes governed by registers in front, as before mentioned; and this air-chamber and the top of the fire-chamber are covered by an air-chamber *q*, into which the air passes from the chamber around the back and sides of the grate, and, after being highly heated therein, passes into the throat through a space left between the lower plate and the lower edge of the funnel-shaped throat, which is attached to the upper plate of the said chamber *q*. The lower aperture of the throat is made in the bottom plate of the chamber *q*, and a part of this aperture extends over the air-chamber at the back of the grate, so that a portion of heated air will enter the throat through the lower aperture—that is, through a part of the same aperture through which the products of combustion enter,—and thus induce a more thorough mingling of the combustible gases with the supporters of combustion. It will be seen that this grate resembles the closed stove above described, except in the form, in the substitution of an open grate for a closed fire-chamber, and in the arrangement of the air-chamber, and the mode of admitting heated air to the throat. And it will also be evident that the plate which divides the drum from the outer casing of the body of the stove can be dispensed with in this as in the other example.

At figs. 6, and 7, which represent the improvements as applied to cooking stoves or ranges, it will be seen that all the parts are arranged in the same manner as at figs. 4, and 5, except that the outer casing of the stove and the drum are larger in proportion, to give ample room for ovens *r*, and

other cooking utensils, and for boiler holes *s*, which may be disposed in any desired manner. The ovens, boilers, and other cooking utensils, are made to project within the body of the stove and drum, that the flame may play around them. In stoves applied to culinary purposes the inventor prefers to dispense with the diaphragm or horizontal partition which separates the drum from the body of the stove, the better to distribute the heat around the ovens and other culinary utensils. It will, however, be obvious that for cooking stoves and ranges the closed fire-chamber may be used as well as the open grate: and, whether for cooking, baking, or for heating apartments or buildings, the fire-chamber may be adapted to the burning of wood as well as coal.

The several improvements may be used separately, and produce some of the advantages contemplated; but it will be found that when all of them are combined, the best effects contemplated by the inventor will be attained.

The patentee states that although he has only described the invention as applied to closed and open stoves or fire-places for heating apartments and for cooking, yet it will be evident that it is applicable to the generation of heat for a variety of purposes, such as hot air furnaces, heating kettles for evaporating saccharine juices, dyers' kettles, steam-boilers, boilers of the kind used on board of whaling ships, puddling and heating furnaces, and a multitude of other purposes in which economy of fuel, the diffusion of flame and heat, and the absence of smoke, are desired. As an example of the manner in which the invention may be adapted to other uses besides those previously described and shewn in the drawings, the patentee states that when it is to be applied to a puddling or re-heating furnace the puddling or re-heating bottom of the chamber is to take the place of the drum or heating chamber, and the throat is of course to be placed between the fire-chamber and the puddling or re-heating chamber,—the small aperture of the throat being towards or in the latter. Instead of one single throat several throats may be employed for this purpose, as a better means of diffusing the flame. And in this application the products of the final combustion may escape from a chimney placed in the usual manner; but he prefers to place the chimney at the same end of the puddling or re-heating-chamber as the throat or throats are placed, whereby the flame will pass and repass over the metal under treatment, or rather remain for a longer time in the chamber than if permitted to escape at the chimney, as placed in ordinary puddling-furnaces.

When the improvements are applied to steam-boilers the first flue or sets of flues under or in the boiler are to take the place of the puddling-chamber in the preceding example; and the products of the final combustion can thus be carried into other flues, either from the rear or from some point above or near to the throat or throats.

The patentee claims, First,—combining the chamber of combustion, in which the fuel of any kind desired is burned, with a drum or heating-chamber, for the combustion and circulation of the inflammable matter evolved from the combustion of the fuel, by means of what he terms a throat, through which the products of combustion pass from the fuel-chamber to be inflamed therein and in the drum or heating-chamber. Secondly,—admitting atmospheric air to the throat which forms the connection between the chamber for the combustion of the fuel and the drum or heating-chamber, that the inflammable gases evolved from the combustion of the fuel in the fire-chamber may be mingled therewith, in passing through the said throat, and be thereby effectively inflamed, and pass in an inflamed and inflaming state into the drum or heating-chamber. Thirdly,—making the lower aperture of the throat that forms the communication between the fire-chamber and drum or heating-chamber larger than the upper aperture thereof, so that the inflammable gases and atmospheric air may be the better commingled in their passage through the throat, and thereby ensure a more perfect combustion. And, Finally,—making the throat with an enlargement between the upper and lower apertures thereof, that the gases that enter the said throat from the chamber of combustion may have room to mingle with the supply of atmospheric air before they pass up and out of the smaller aperture above into the drum or heating-chamber, as described.—[*Inrolled January,* 1849.]

To THOMAS RICHARDSON, *of Newcastle-upon-Tyne, chemist, for improvements in the condensation of metallic fumes, and in the manufacture of white lead.*—[Sealed 21st August, 1848.]

THE first part of this invention consists in preparing what is known in the trade as tea-lead for the manufacture of white lead, and in treating this lead, so prepared, or other suitable lead, in a particular manner for the production of white lead.

The tea-lead, in a melted state, is exposed to a slow current

of hot air in an ordinary red lead furnace, or in an iron pan encased in brickwork; the tin contained in the tea-lead is thereby oxidized and flows on the surface, mixed with a small quantity of oxide of lead; and the workman removes the oxide, thus formed, by means of an iron rake, from time to time: the process is complete when the melted lead has become so soft as to be easily scratched by the finger-nail; and then the lead is removed from the furnace and cast into moulds.

In explaining the method of manufacturing white lead according to this invention, the patentee divides his description into three parts, viz., first, the materials and the preparation of the same; secondly, the apparatus employed; and thirdly, the process of manufacture. First, with regard to the materials and the preparation of the same, the patentee uses lead in the metallic form, in a fine state of division, either in crystals, which are produced in the de-silverising process of Pattinson, or as granulated lead made in the ordinary way; and he also employs acetic or nitric acid of commerce, or a mixture of the same, diluted with a corresponding quantity of water, or a solution of acetate or nitrate of lead, or a mixture of the same, containing the same amount of acetic or nitric acid, together with steam, hot air, and carbonic acid. Secondly, with reference to the apparatus employed, this apparatus is represented in Plate VIII.: it consists of a framework *a*, the interior of which is divided into compartments by the double shelves *b*, *c*; the space *d*, between each pair of shelves *b*, *c*, is intended to receive steam or hot air from a suitable pipe, as shewn at *e*, for the purpose of heating the shelves; into each compartment carbonic acid gas is introduced through a pipe *f*, and the apparatus is closed, when the manufacture of white lead is going on, by means of doors *g*. Thirdly, the process of manufacture: this consists in moistening a loose mass of finely-divided metallic lead, from time to time, with acetic acid or any other of the solutions above-mentioned, in the proportion of from 2 to 3 gallons of commercial acetic acid to 20 cwts. of lead, turning the mass over several times. From 20 to 30 cwts. of the lead, thus prepared, are spread upon each of the shelves *b*, with a wooden rake, and the apparatus is closed by means of the doors *g*; carbonic acid is then admitted into the compartments, through the pipes *f*, and is allowed to remain in contact with the lead until the latter is converted into crude white lead; at the same time, by the admission of steam or hot air into the spaces *d*, the interior of the apparatus is heated to 90° or 100° Fahr.;

and this heat is maintained as steadily as possible during the period of conversion. Steam is occasionally admitted into the chamber to maintain the artificial atmosphere of carbonic acid gas in a moist state, but not to such an extent as to do more than render the lead damp to the touch. The conversion of the lead into white lead will generally be effected in from 10 to 14 days; and the degree of conversion may be at any time ascertained by pounding a little of the lead in a mortar with water, which leaves the metallic lead at the bottom of the vessel after the suspended white lead has been poured off. When the process of conversion is finished, the crude white lead is ground under a pair of edge-stones and washed in a dolly-tub; and the white lead which floats away from the dolly-tub is collected in a subsiding vessel or cistern, and finally ground between a pair of horizontal stones, washed, and dried.

The second part of this invention consists in the following mode of condensing metallic fumes:—Into the main flue, with which the various furnaces employed in treating different metallic substances are connected, steam is introduced through small iron pipes, one of which enters the flue at a distance of from one to two feet in advance of each furnace. Each pipe is provided with a stop-cock; but it is immaterial whether each furnace is at work or not, so long as steam enters the flue in advance of the last furnace which is at work, and in sufficient quantity to maintain the requisite draft in the chimney while the condensation of the metallic fumes is effected. At or near the chimney, with which the main flue communicates, a tower is erected, about twenty feet high, and divided into two compartments by a wall, which reaches to within a certain distance of the top of the tower; the capacity of each division of the tower and the passage between them at the top of the partition wall is made a little larger than the capacity of the main flue in connection with it; midway in the descending division of the tower a number of iron bars are fixed, and on these are laid pieces of hard burnt coke, broken bricks, &c., about the size of small paving stones; and the top of the tower is pierced with holes, one-fourth of an inch in diameter, through which a continuous supply of water is kept running, which, falling upon the pieces of coke, is scattered on all sides, and is thus brought into contact with the metallic fumes, already in a damp state from the partial condensation of the steam admitted into the main flue. If it should be found necessary to make the depth of the layer of coke so great (in order to effect the

perfect condensation of the metallic fumes) as to lessen the requisite draft of the chimney, the patentee introduces one or more sets of steam, upon Mr. Watson's plan, into the flue, between the tower and the chimney.

The patentee claims, Firstly, the separation of tin and other impurities from tea-lead by means of oxidation through the use of hot air. Secondly,—the use of carbonic acid and acetic or nitric acid, alone or mixed, free or combined with oxide of lead, steam, and hot air, for the conversion of metallic lead into white lead. Thirdly,—the use of steam in conjunction with a shower of water, and with or without a steam jet for condensing metallic fumes.—[*Inrolled February,* 1849.]

To Alexander Angus Croll, *of the Gas Works, Tottenham, in the county of Middlesex, for improvements in the manufacture of gas, and in apparatus to be used in transmitting gas.*—[Sealed 22nd August, 1848.]

The first part of this invention relates to the manufacture of gas by the use of retorts which can be fed at each end.

When such retorts have been heretofore used, they have been provided with a rising pipe at each end to carry off the gas produced, instead of which the patentee applies a rising pipe only at one end of the retort; and in place of feeding both ends alternately, and at distant periods, one from the other (as heretofore), he charges both ends at the same time: he states that considerable advantages will result from this improvement.

The second part of this invention consists in passing steam through carbon at a bright red heat, and then causing it to pass over or amongst the charge of coal which is being distilled in a retort.

The patentee prefers to use retorts such as those above described. He charges the same with coke at the end most distant from the rising pipe, to which end he also applies a pipe for introducing steam; and at the other end of the retort he introduces a charge of coal once in every five hours, allowing the steam to flow in for about three hours after the introduction of such charge. He has found that advantageous results may be obtained by evaporating fifteen pounds of water, and passing the steam into the retort, for each ton of coals distilled (that is to say, when Newcastle coal is used, but when Kennet coal is used, the quantity should be increased); he does not, however, confine himself to this pro-

portion, the object being to obtain a larger quantity of gas, of a fair illuminating power, and a smaller quantity of tar.

The third part of this invention consists in the employment of sulphurous acid, in such manner as to deprive carburetted hydrogen gas of the sulphuretted hydrogen gas with which it is contaminated, and thus to obtain the sulphur of both compounds in the form of flowers of sulphur.

A solution of sulphurous acid in water is made, by connecting a vessel or vessels of cast-iron (arranged as a Woolfe's apparatus) with an oven in which sulphur is burned, and, by means of an air-pump, causing a current of sulphurous acid gas, from the burning sulphur, to pass through the water contained in the vessel or vessels, until the same is nearly saturated with sulphurous acid: to effect this, about six ounces of sulphur must be burned for each gallon of water. The solution is transferred to the first of three vessels, which are constructed and arranged in the same manner as the ordinary wet lime purifiers; and the other two vessels are charged with a weaker solution, derived, after the process has been once performed, from the washers hereafter mentioned, and from a portion of the sulphurous acid which is disengaged from the first vessel. The gas is passed through the three vessels in succession, commencing with the first, whereby the sulphuretted hydrogen in the coal-gas and the sulphurous acid are both decomposed, and sulphur is deposited. When the sulphurous acid in the first vessel has been all decomposed, or nearly so, the contents are discharged into a suitable receiver, in which the sulphur may settle, or it may be separated from the liquor by filtration; and it is to be afterwards dried. The first vessel is charged with a fresh solution, and the operation goes on as before.

Instead of preparing the solution of sulphurous acid in a separate vessel, and using one set of purifiers, as above described, the patentee prefers to employ two sets of purifiers alternately, and to charge the liquid with sulphurous acid in the first vessel of one set while the coal-gas is passing through the other set; and instead of using water to form the solution, he prefers to transfer the liquid, already partially charged, from the second vessel into the first, to supply the second vessel from the third, and to change the third from the washers.

Owing to the volatility of the sulphurous acid a portion of it is carried over with the gas; and therefore, to free the gas from this impurity, it is caused to pass through three other vessels, called washers; and, finally, to remove every trace of

impurity, it is passed through a common dry lime purifier. The washers are arranged so as to be put in connexion with either series of purifiers at pleasure; and any construction may be adopted which will admit of the gas passing freely, and at the same time being thoroughly exposed to the water: the ordinary lime purifiers answer well for this purpose. The washers are charged with water only; and, as it becomes impure, it is transferred through the series onward, and then into the purifiers,—only the last vessel of the series being supplied with the fresh water.

The last part of this invention relates to the mode of transmitting gas through mains to supply districts at a distance from the gas-works.

It has been proposed, in order to effect this object, to provide gas-holders in the district to be lighted, and to force gas into the same by means of suitable exhausting and forcing apparatus. Now, the peculiar character of this part of the invention consists in working in such manner that the gas in the main, between the gas-works and the exhausting apparatus in the vicinity of the distant gas-holder, may be maintained at a proper degree of pressure for supplying the intermediate district. For this purpose, the patentee uses exhausting apparatus capable of withdrawing the gas to such an extent as to exhaust the main, so that if no provision were made for maintaining the gas at the proper pressure in the main, no supply of gas to the intermediate district could take place from the main when the exhausting apparatus was at work. The gas-holder is connected with the main by a branch-pipe, which proceeds from the main at a point beyond the exhausting apparatus; and to this pipe the patentee applies a governor, which he prefers to be of the kind commonly used at gas-works, to regulate the pressure of gas in the main. By means of this arrangement, although the exhausting apparatus will, when at work, be continually propelling gas into the gas-holder from the main, with a tendency to exhaust the main, yet a quantity of gas will at the same time pass from the gas-holder through the branch-pipe into the main: this quantity is regulated by the governor, which will thus keep the gas in the main at the desired working pressure; and the gas-holder at a distance from the works will only be supplied, by the exhausting apparatus, with the quantity of gas which would otherwise cause the gas in the main to rise in excess of the desired working pressure.

The patentee claims, Firstly,—the mode of manufacturing gas, above described, whereby retorts capable of being fed or

charged at each end are employed,—the gas being conveyed away at only one end. Secondly,—the mode of applying steam in the manufacture of gas, as above described. Thirdly,—the purifying of coal-gas by employing sulphurous acid gas so as to separate and thus obtain the sulphur in the form of flowers of sulphur. Fourthly,—the mode of arranging apparatus for transmitting gas, as above described.—[*Inrolled February*, 1849.]

To WILLIAM BETTS, *of Smithfield-bars, in the city of London, rectifier, and* GEORGE WILLIAM JACOB, *of Canonbury-street, Islington, in the county of Middlesex, printer, for improvements in the manufacture of capsules, and in the application of designs by certain descriptions of surfaces.*—[Sealed 30th November, 1847.]

THE first part of this invention relates to the manufacture of metallic capsules for covering the tops of bottles.

Metallic capsules have been heretofore applied to bottles in the manner described in the specification of a patent granted to John Thomas Betts, August 11, 1842; and such capsules have had letters or patterns embossed or indented thereon, but without any color being used in the production of the same. Now this part of the present invention consists in causing the capsules to be embossed, printed, or indented with color, or ornamented with a colored design, in the following manner:—The patentees mix thick lithographer's varnish with boiled linseed oil until it is about the consistence of treacle; they then grind upon a common painter's stone as much dry color as can be conveniently mixed with the varnish, and add a small quantity of japanner's gold size; and they mix the whole intimately together. The color, thus prepared, is applied, by a printer's roller or other suitable means, to the die or engraved surface by which the capsule is to be stamped; a plain unembossed capsule, free from dirt or grease, is placed upon the die or engraved surface; and then, by the pressure exerted in stamping, the capsule becomes embossed, ornamented, or printed in color. A similar result may be obtained by charging the raised portions of the die or engraved surface with the color or with the varnish and japanner's size only, and then, after the capsule has been embossed or printed, and before the color or varnish has become set or hard, applying gold, silver, or

Dutch metal leaf thereto, or dusting on bronze powder or any other dry powder or pigment.

The patentees claim, under this head of their invention, the manufacture of capsules having a design embossed or printed in color thereon.

The second part of this invention consists in the production of colored designs on hard surfaces, such as glass, wood, stone, tin-plate, or iron, by laying color or varnish thereon, and, before such color or varnish has become dry and hard, applying gold, silver, or Dutch metal leaf, bronze powder, flock, or other dry powders or pigments, so as to produce a legible pattern or letters which cannot be easily removed or rubbed off.

The method of effecting this improvement is as follows:—The patentees grind upon a stone a sufficient quantity of burnt stone-ochre with boiled linseed oil; and they then mix therewith about eleven times the quantity of japanner's gold size. With this mixture they charge the types, block, or other printing surface, by the common printer's roller, or other suitable means; after which they apply a roller or flat piece of printer's composition, previously rubbed over with powdered French chalk, to the printing surface, in order to transfer the mixture from the latter to the former; and then they apply the roller or flat piece of composition to the surface on which it may be desired to produce the pattern or letters. It seldom happens that the roller or piece of composition is perfectly printed by one application to the printing surface—the patentees therefore recommend that the printing surface should be fastened securely in a suitable position, and the flat piece of composition placed in a frame which is capable of moving upon a hinge, similar to the tympan of an ordinary printing-press, so that it can be brought down evenly upon the types or other printing surface: by this means the piece of composition may be repeatedly applied, with great accuracy, to the printing surface, until it has received a perfect impression;—the mixture being applied to the types or printing surface as often as may be found requisite. The patentees take the bottle, glass, wood, stone, tin-plate, iron, or other hard substance, on which the design is to be produced, and press it or roll it with a slight pressure on the printed piece of composition, so as to effect the transfer of the mixture; then they immediately apply the gold, silver, or Dutch metal leaf, or dust on bronze powder, flock, or other dry powder or pigment; and the articles so

treated are left to dry, which will take about twenty-four hours: if additional security be required, the pattern may be finished with a drying varnish.

The patentees state that they do not claim as new the production of a pattern upon glass, wood, stone, or iron, or other similar surfaces, by transferring the pattern from the types, or block, or other printed surfaces, by means of glue and treacle simply; the same being part of the invention described in the specification of a patent granted to George William Jacob (one of the present patentees) on November 12, 1846,* "for a new manufacture of printed, patterned, ornamented, colored, embossed, and moulded surfaces;" but they do claim as new the printing on glass, wood, stone, tin-plate, iron, or other hard surfaces by the method above described, and then applying gold, silver, or other leaf, or dusting on bronze, flock, or other dry pigment or powder.—[*Inrolled May*, 1848.]

To HENRY WILSON, *foreman to Messrs. William Greaves and Sons, of the Sheaf Works, Sheffield, for improvements in the manufacture of chisels and gouges.*—[Sealed 21st September, 1848.]

THE patentee commences his specification by stating that, in the manufacture of chisels and gouges, it has been the practice to make some with sockets and others with tangs, for the purpose of affixing the handles to the same;—the tangs and sockets in each case being used alone. The object of this invention is to combine the use of a socket and a tang with the same chisel or gouge, whereby each of such tools may be applied to the ordinary uses of a chisel and gouge, and to morticing, so that the workman will not require to have a tool for each purpose.

The old socket-chisels and gouges have wooden handles inserted into their sockets; those handles, when the tool is being used, receive the blows or strokes of a mallet, and often those of a hammer, and are much subjected to lateral strain; from which circumstances the handles are liable to break off at the upper edge of the sockets; and the patentee considers that the addition of tangs to such tools will give greater stability to the handles. The ordinary tanged chisels and gouges

* For description of this invention, see Vol. XXX. of our present Series, p. 339.

also have wooden handles, which are drilled, and the tangs are driven into them; and in some cases ferrules are applied to the lower parts of the handles: the handles of these tools are liable to be split not only by the side strain to which they are subject when in use, but also by reason of the tools being often driven by a mallet or hammer; and it is to obviate these defects that the patentee proposes to combine sockets with the tangs. In making chisels and gouges according to this invention, the sockets may be forged with the tangs, or be welded, brazed, or otherwise affixed thereto.

The patentee claims the mode of mauufacturing chisels and gouges by combining the use of tangs and sockets in the same instrument.—[*Inrolled March,* 1849.]

Scientific Notices.

ON PATENT LAW REFORM.

ARTICLE III.

THE recent publication of the "Return of the number of letters patent sealed for the last ten years ending 31st December, 1847, together with the fees paid thereon," has, from the valuable data it contains, induced us to defer for a while our further remarks of the working of the patent laws, and to take up that branch of the subject which refers more particularly to the pecuniary transactions between inventors and the public; with the view of drawing attention to the policy of obtaining a revenue from the granting of patents—to the amount produced from this source—and the mode of appropriating the fees thus obtained. If in the course of this enquiry we should be so fortunate as to discover that there is yet an undeveloped source of national income available for public purposes, let us hope that the comparative insignificance of the sum that might be raised, when viewed in connection with the aggregate annual amount of our taxation, will not blind the Chancellor of the Exchequer to the merit of our successful labors, but that it will draw him, by a feeling of gratitude, to the cause of patent law reform. On the other hand, if it be found that the deriving an income from the grant of letters patent for inventions tends to cripple manufacturing industry, we will not think so lightly of the wisdom of the President of the Board of Trade as to doubt that his support and influence may be relied on, to effect,

in co-operation with the advocates of patent law reform, an immediate change in the present system.

It is seldom that Returns, involving an exposure of the amount of private incomes derived from fees, have been as fully and fairly stated (unless with the prospect of compensation in view) as those now before us; but yet there are traces of an inclination to mystify, which have rendered it necessary that some of the statements should be cleared up. This Return of patents sealed, and fees paid thereon, was granted on the motion of Mr. Bouverie, and ordered to be printed on the 12th February, 1849, a day we trust hereafter to be held memorable by inventors; for, if the statements then given to the world do not make evident to the ordinary reader the injustice of the existing system of granting patents, they furnish sufficient data for such as are well acquainted with the subject to draw out an unanswerable case for patent law reform. Without pretending that our labors may be so designated, we will proceed to note down some reflections to which the Return now before us gave rise; and having done so we shall rapidly pass in review the substance of the paper itself.

Industrial prosperity (as has already been shewn in these pages) can only exist where the introduction of a succession of new inventions into the various branches of the manufacturing arts is ensured; and as a sequence, whatever tends to check the development of ingenuity is a national evil. The tendency of high-priced patents is undoubtedly to stifle inventions; as the poor man, without sacrificing a great portion of the profits anticipated from his ingenuity, is unable to get his right to his own discoveries publicly acknowledged. But, although this effect of high-priced protection is easy of demonstration, and its injurious and wide-spread results may be clearly traced by any reflecting mind, yet we think that in this age of financial reforms if we can shew, by *figures*, that inventors are laboring under a heavy pecuniary burden, but little advantaging the Exchequer, there will be much more hope of obtaining legislative redress than from parading before the world the clearest deductive proofs, which would require the mind rather than the eye to follow them and ascertain their value.

Now, as respects the injudicious nature of the existing tax on patents, if it be admitted—and we think no one at all acquainted with the rise and progress of the manufacturing arts will deny it—that it is essential to the prosperity of our manu-

factures that a constant succession of inventions, calculated to facilitate production and improve the quality of the articles produced, shall be forthcoming, it is clear that an inducement must be held out to ingenious men to furnish such improvements as will maintain and advance our manufacturing prosperity. This development has been provided by insuring to inventors an exclusive use, for a limited period, of their own improvements; and experience has proved that this simple act of justice, costless to the grantor, has sufficient potence to draw forth a succession of ingenious contrivances which, by removing practical difficulties as they arise, enable manufacturers to compete more or less successfully with foreign rivals. But if, in addition to the public advantages derived from the introduction of a new and useful invention to any branch of our manufactures, a sum of money be demanded for the privilege of an exclusive use, for a limited period, of such an invention, it is manifest that in exact proportion to the amount demanded will the inducement to invent be lessened; and also that in opposition to the recently accepted principles of taxation a direct tax is levied upon a branch of industry without the healthy existence of which our manufactures would dwindle into insignificance. This tax, too, is the more obnoxious as it is levied upon the germ instead of the crop—upon suggestions of doubtful utility and not on the profit resulting from inventions successfully applied; for few are the inventions that are perfected before they are patented, and fewer still are found profitable when patented.

We will now attempt to shew, with the help of the Return (eked out with some of our own calculations), what is the annual amount paid for these privileges or stimulants to ingenious men to direct their attention to the preservation of our manufacturing prosperity. The Return embraces the number of patents sealed in England, Scotland, and Ireland, and the amount, or the scale, of fees paid thereon during the last ten years ending 31st December, 1847: for our present purpose, however, we shall consider merely the Returns relating to the years 1845-6-7. The distribution of the fees, and the order of payment for English patents may, without entering into minute and unnecessary particulars, be thus generally stated:—The first disbursements are at the Secretary of State's Office: next come the Attorney and Solicitor-General's fees for the Reports, Hearings, and Oppositions; then the Bill Office charges; after which follow those of the Signet Office, the Privy Seal Office, and the Great Seal Office. The several

items may be thus stated for the three years, which we have taken :—

		1845				1846				1847		
	Patents sealed	572				494				498		
		£	s.	d.		£	s.	d.		£	s.	d.
Fees paid.	Secretary of State ..	10,783	5	0	..	9,311	18	0	..	9,387	6	0
	Attorney and Solicitor-General's Reports*	3,196	4	0	..	2,654	8	0	..	2,956	16	0
	Oppositions and Hearings......	1,584	0	0	..	1,274	15	0	..	1,808	15	0
	Bill Office†	10,823	0	0	..	8,990	4	0	..	10,017	4	0
	Signet Office	3,118	16	6	..	2,606	7	0	..	2,693	1	6
	Privy Seal	3,218	3	0	..	2,608	11	0	..	2,627	18	0
	Great Seal	27,698	9	8	..	24,098	14	8	..	24,327	9	2
	Total	£60,421	18	2		£51,544	17	8		£53,818	9	8

From this statement it appears that the average annual payments for English patents amount to £55,261; but this is by no means the whole expense incurred in obtaining these privileges; for, as there is a special provision in these grants that the patentee "shall fully describe and ascertain the nature of his invention, and enrol the same in Her Majesty's High Court of Chancery," the expense of preparing this document might very properly be set down as a portion of the tax with which the inventive interest is burdened. We shall not, however, complicate our case with any estimate of private expenses thus necessarily incurred by patentees, but confine ourselves to the payments actually made at the government offices. Thus, at the three several enrolment offices the fees received on recording the specifications of patents were for the years 1845-6-7 respectively—

	£	s.	d.		£	s.	d.		£	s.	d.
Enrolment Office	812	11	0	..	837	16	0	..	778	15	6
Petty Bag Office	265	2	9	..	310	16	10	..	274	15	0
Rolls Chapel Office ..	64	2	6	..	43	10	0	..	51	3	0
Total	£1,141	16	3		£1,192	2	10		£1,104	13	6

* Our estimate in Article I., gave 767 applications for patents in 1845, of which we set down 230 as opposed; by the official return, since published, we find the exact number of applications to have been 774, of which 226 were opposed; this, however, proves the closeness of our calculation.

† The number of the Bills signed, and the gross amount paid thereon, being omitted in the Return, we have assumed the number, by deducting 10 per cent. from the number of Reports granted, and obtained the above amounts by multiplying by £15. 16s. the cost of the Bill.

making an average of £1,146 yearly. To this sum we must add the amount paid for stamps on the specification,—a £5 stamp being required on the first skin for the first 30 folios of writing, and a £1 stamp for every succeeding 15 folios. From a careful calculation we find that the average length of a specification may be estimated at 50 folios, which will make the stamp duty on every specification amount to £7. The number of specifications enrolled in the respective years we have taken, were 487, 492, 460, making an average of 480. This number multiplied by 7 will give £3,360 as the annual sum raised from stamps on English specifications. From these statements it will be evident that the annual tax levied upon inventors prior to their being able to introduce the results of their study and experiments to the English manufacturer, and thereby assist him in carrying on his business with success, is, for the

Patent grants	£55,261
Stamps on specifications	3,360
Enrolment fees on ditto	1,146
Total	£59,767

But the outlay of this sum gives the inventor protection only in one-third part of the United Kingdom: Ireland and Scotland do not benefit from any of those improvements which have been secured for a limited period to their respective inventors by the payment of the sum of £59,767, (unless, indeed, the improvements are purloined and adopted in those parts of the kingdom against the consent of the inventors); a further payment amounting to nearly double that received on English patents would be required before the inventors could obtain an exclusive right in Great Britain and Ireland over their respective inventions. The immediate effect of this policy is to prevent many English patentees from carrying out their improvements in Scotland, and almost wholly to exclude from Ireland those sources of profitable employment which might raise her peasantry from sloth and degradation to comparative wealth and contentment. This effect will be seen by a comparison of the number of patents granted in the years 1845-6-7 in the three kingdoms; they were as follow:—

England	572	494	498
Scotland	205	178	168
Ireland	95	90	76

On first glancing over these figures one might infer that Scotland and Ireland had the advantage over England in con-

sequence of the English inventions which were not patented in those countries being open to general use; but here a little fact, which has been too much overlooked, presents itself, and goes far to prove that not only is the granting of patents just as regards the inventor's claim to a reward for his ingenuity, but that it is most politic as respects the public interest. The fact is, that what is worth the attention of a man who is sure of a reward proportionate to the success of his exertions will receive no consideration from those who are conscious that their own success would only bring rivals to divide the fruit of their labors.

The mere suggesting of an improvement, it should be borne in mind, is not sufficient to ensure its adoption,—it is the patient application of practical knowledge to the working out of a happy thought that is essential to the advancement of any branch of our manufactures. Without this, therefore, the mere indication of an improvement, as set out by a patentee in his specification, would be valueless; and who, unless for a prospective personal advantage, could be found to expend time and money in testing the utility of a suggested improvement, even though it might be had for nothing? Thus hundreds of useful schemes, abandoned by their projectors, as far as Scotland and Ireland are concerned, are allowed to remain a dead letter in those countries,—apparently for no other reason than that the oppressive nature of the tax levied on ingenuity precludes them from obtaining such an interest in the three kingdoms, in the success of their inventions, as would form an adequate inducement to them to apply themselves diligently to the working out of their plans. It might reasonably be asked, for what purpose are the heavy fees retained which tend so evidently to cripple the exertions of inventors and defraud the public of much of their valuable services? We can give no other answer than that a want of knowledge, in high places, of the importance of that class of the community has caused their interests to be almost entirely overlooked. It is, in our opinion, essential that patents should produce a revenue equal to the liquidation of all expenses incurred upon granting them; but, further than this, we believe it to be inexpedient to tax the inventor. Now, although patents, in their progress to completion, pass through a variety of stages, yet, with the exception of the grant of the Attorney and Solicitor-General's Report, there is not one of these stages which might not, with advantage, be abolished, and that without the creation of any substitute whatever. The

whole system may be truly designated as a useless, senseless form, fit only to provide sinecures for government nominees. We have no desire to reflect upon any of the place-holders at the Bill, Signet, Privy Seal, and Great Seal Offices; for, although we are not acquainted with their deserts, we doubt not that the country is in some way deeply indebted to the exercise of their unobtruded virtues, or, at least, to the patriotism of their ancestors,—and a quiet lucrative post, however inadequate a recompense, is all that government has to offer; but we do not see very clearly why inventors should have so large a portion of the honor of paying for such unostentatious services. It would be difficult to discover what portion of the average annual sum of £55,261 obtained from patents for inventions is distributed to the holders of these quiet posts, for a plan has lately been, in part, adopted of paying fixed salaries, and turning over the remanet of the fees to the Consolidated Fund; but, as a specimen of the mode of appropriation, we will take the Signet Office, where the arduous duty of "engrossing the official heading" to the Signet Bill —the time necessary for effecting that transaction being under five minutes for each patent—realized, in the year 1845, £3,118. 16*s*. 6*d*. This sum was apportioned in the following manner:—

Consolidated Fund.	First Clerk and Deputy.	Second Clerk and Deputy.	Third Clerk and Deputy.	First Record Keeper.	Second Record Keeper.
£669 18 4½	£669 18 4½	£669 18 4½	£669 18 4½	£219 11 6	£219 11 6

It is perfectly inconceivable how the three clerks, three deputies, and two Record Keepers, could have divided this five minutes' job amongst them, so as to do anything for the money; we are not therefore surprised to learn that recently, on the occurrence of some vacancies, it was found that a first clerk and his deputy could, in future, be dispensed with; and that, in spite of the extra duties thus falling to the share of the second clerk, an efficient servant could be procured for that situation at the reduced salary of £300 per annum. With respect to the Return furnished by this Office we may observe, that it gives no account of the extra fees received, which we think must be considerable; for as it has been found impossible to transact the ordinary business of the Signet Office on any other day than Friday, all persons requiring the "engrossing of the official heading" (the five minutes' job) to be done on any other day, must pay to these overworked clerks, deputies, and Record keepers, an expedition-fee of £1. 11*s*. 6*d*., which ensures their prompt attention.

The appropriation of the fees at the Great Seal Office must not be omitted to be noticed, as it affords an excellent specimen of the use made of the hard-earned money wrung from the needy inventor. We should, by the way, observe, that the duties of this office, with the exception of the mere act of *sealing* the patents, are performed in an efficient manner by the deputy of the Clerk of the Patents: they cannot, therefore, be very arduous; but the anxiety perhaps attendant on "receiving and accounting for the fees" may be considered as an equivalent for the non-performance of any actual duties by the responsible clerks of this office. In the year 1845, upon the 572 patents then sealed, fees to the amount of £27,698. 9*s*. 8*d*. were levied; of which sum £17,217. 4*s*. went for stamps, and £4,224. 19*s*. 4*d*. to the Consolidated Fund and Fee Fund of the Court of Chancery, making a total of £21,441. 13*s*. 4*d*., available for the public service; while the remaining sum of £6,256. 16*s*. 4*d*. was thus disposed of to sinecure place-holders.

Lord Chancellor's Purse Bearer.	Clerk of the Hanaper.	Deputy Clerk of the Hanaper.	Deputy Sealer and Deputy Chaff Wax.
£1,380 1 0	£4,273 0 4	£301 17 6	£301 17 6

But, as if the ordinary fees, taken at this office, were not sufficient, an ingenious contrivance has been adopted to mulct patentees out of an extra sum. The plan consists in so arranging the Public Seal days, that it shall be next to compulsory that a Private Seal shall be required to prevent delay; by which means an extra £2 is extracted from the patentee. The success of this contrivance is thus stated in the Return:—Patents passed under the Great Seal from the 6th July, 1846, to the 31st December, 1847,—

By Private Seal	382
By Public Seal	371

making an extra sum of £764 raised by Private Seals. Added to this is a further charge for special journeys, varying from £1. 11*s*. 6*d*. to £5. 5*s*. on every patent, whenever the Lord Chancellor is absent from town.

To sum up the whole matter as regards the pecuniary transactions between inventors and the public, it may be stated that the average annual payment on English patents and specifications (exclusive of some private fees the amount of which it has, we suppose, been found inconvenient to publish in the Report) is £59,767; and that if all the inventions patented in England were made the subjects for Scotch and Irish patents, a further payment, amounting to nearly £120,000, would be required from inventors, according to

the method now employed for extracting the fees. If the money thus wrung from patentees were required for supporting an efficient staff of examiners and others, whose duties were to accept or reject applications for patents, according to the value or novelty of the respective inventions, or even if the proceeds of the tax thus imposed were applied as part payment for any useful state services rendered—as is the case with the fees received by the Attorney and Solicitor-General—there might be reason in maintaining the present system; but while we see thousands annually squandered upon placeholders, whose duties (if they have any) are to impede the progress of patents, we shall not consider our duty performed by remaining silent spectators of this misappropriation, while the smallest opportunity presents itself of furthering the cause of patent law reform. The following analysis of the sums paid on English patents for 1847 will shew the general distribution of the whole amount:—

	£	s.	d.
Stamps (£6) on the Bill, the estimated number being 634	3,804	0	0
" (£30) on Patent, the number being 498	14,940	0	0
" (averaging £7) on Specifications, the number being 460	3,220	0	0
Total	£21,964	0	0
Paid to Consolidated Fund from Secretary of State's Office	9,387	6	0
Signet Office	1,730	2	3½
Privy Seal Office	2,627	18	0
Great Seal Office	2,863	3	8
Total	£16,608	9	11½
Paid to Fee Fund of Court of Chancery	776	12	10
" Enrolment Offices...........................	1,104	13	6

making a total of £40,453. 16*s*. 3½*d*. devoted to public uses; from which, however, the salaries of the clerks of the different departments should be deducted. By the Attorney and Solicitor-General and clerks there was received for—

	£	s.	d.
Granting their Reports	2,956	16	0
Hearings and Oppositions	1,808	15	0
Signing the Queen's Bill	3,170	0	0
Total	£7,935	11	0
At the Bill Office there was received by the clerk of the patents and engrossing clerk	3,043	4	0
At the Signet Office the alteration above noticed having come into operation in 1847, the clerks, deputies, and Record keepers received (exclusive of expedition-fees) only	962	19	1½
And at the Great Seal Office the gross sum received by the purse bearer, the clerk of the hanaper, deputy clerk of the hanaper. deputy sealer, and deputy chaff wax, was	5,687	16	8

thus making a total of £17,629. 10*s*. 9½*d*. absorbed by parties who, with the exception of the Attorney and Solicitor-General, either do nothing, or, if they act, perform a nullity, which serves only to retard the progress of the patent. This result of our examination of the Report on Patents we commend to the attention of the Chancellor of the Exchequer.

On the phosphate and carbonate of lime contained in plants, and on the influence which these calcareous salts have upon germination and vegetation :—

Presented to the Academy of Sciences, Paris, by M. J. L. LASSAIGNE.

THE influence of earthy phosphates on the development of cereals has been established by many facts; and, according to Liebig, the plants which proceed therefrom would not come to maturity without the presence of those salts. In fact, earthy phosphates have been met with in almost all soils in which cereals are cultivated. The employment of animal manure serves each year to restore to the soil that portion of those salts of which it has been deprived for the food of man or beast, and which forms a constituent part either of their fluid or solid parts. This action of phosphates upon vegetation explains the very powerful effect of pulverized bones upon certain soils; and experience proves the great efficiency of these substances as manures. But while the mode of introduction of soluble salts into vegetable matters was found easy of explanation, it was considered more difficult to explain the manner in which insoluble mineral principles, such as the above-mentioned phosphates, are transmitted.

Many hypotheses had been put forth regarding this important question; for the solution of which a series of experiments (the results of which are now before the Academy) were undertaken.

The primary inquiries made were:—1st. Whether basic phosphate of lime, as it exists in the bones of animals, was soluble in water charged with carbonic acid? 2nd. In what proportion it was soluble. 3rd. Whether the solution was favorable or not to the germination and vegetation of cereals? 4th. Whether, in the various parts of the plant, when developed, a certain quantity of the same phosphate was not to be found?

First Experiment.—Sub-phosphate of lime is soluble in water saturated with carbonic acid at the ordinary pressure and temperature. This proposition, which has been deduced from actual experiment, was promulgated by M. Dumas in his opening address to the Faculty in 1846. Some years previously M. Gasparin, in his excellent "Course of Agriculture," (Vol I., pp. 107-8), stated

that phosphate of lime passed into plants in a state of solution in water charged with carbonic acid, without, however, practically demonstrating the same. M. Lassaigne being thus far informed, but not being aware of the experiments that M. Dumas was undertaking, announced, towards the close of the year 1846, to the Academy of Sciences, that water saturated with carbonic acid gas, at a temperature of $+10°$, and at the mean pressure of the atmosphere, dissolves the basic phosphate of bones in the proportion of $\frac{75}{100000}$ of its weight, or in ordinary fractions $\frac{1}{1333}$.

It was ascertained that this solution is decomposed by the action of caloric, and that the basic salt is separated from it by saturating the carbonic acid with potash or ammonia.—On examining the action of water charged with bicarbonate of lime upon this same basic phosphate, this latter salt was also found to be dissolved, but in smaller quantity.

This fact having been proved beyond a doubt, experiments were next made upon bones, both fresh and partly decomposed, by being for some time buried underground. These latter were reduced to pieces about the size of a small nut, and after being steeped about ten hours in water saturated with one volume of carbonic acid, they furnished a certain quantity of their inorganic base, that is to say, a portion of their carbonate and phosphate of lime; when the bones are pulverized, even coarsely, a larger proportion of these basic salts is dissolved by the solution of carbonic acid. Subsequent experience has shewn, that the relation of the phosphate of lime to the carbonate of the same base, dissolved by this solution, is about the same as that which exists in the bones, according to the analyses made by M. Berzelius.

The results of the above experiments, therefore, go to prove that the calcareous salts which enter into the composition of the bones of animals, may, after decomposition, by being buried underground, be partially dissolved by the infiltration of rainwater, and by reason of the portion of carbonic acid held in solution by the water.

Second Experiment.—The above facts led to an enquiry as to the influence upon germination and vegetation of this solution of phosphate and carbonate of lime in water saturated with carbonic acid.

In two glass vessels, of a capacity of 200 cubic centimetres (about 6 feet), each containing 250 grammes of siliceous sand, purified by washing in hydrochloric acid, four grains of fine wheat, gathered in 1846, were sown. The sand, contained in the vessels, was irrigated, the one with water charged with its volume of carbonic acid, and the other with the same water holding in solution phosphate and carbonate of lime, obtained from bones decomposed by being underground. These two vessels were placed upon a hollow porcelain plate, and covered with

a bell glass, of a capacity of about six quarts, in order to protect them from any dust floating in the air. This apparatus was placed upon a moveable wooden stand, so that it could be moved, when desired, towards a window exposed to the direct action of the solar rays. The surrounding air was maintained, as nearly as possible, at a temperature of from 10° to 12° centigrades. All the seeds contained in these two vessels germinated in less than two days, and the plumula was gradually developed in the same manner as in the open air, producing two fine green leaves. The growth of those seeds in the sand wetted with the solution of the calcareous salts from the bones, was more rapid than that of those treated with the water charged with pure carbonic acid.

The leaves furnished by the former were generally larger, stronger, and of a deeper green; but twenty-five days after germination the vegetation of the plant became less healthy; the ends of the leaves became yellow, which gradually extended to the stalk. At this time the height of the stalks produced from the grains, treated with the distilled water saturated with carbonic acid, was about from 2⅝ to 2⅞ inches (0·m065 to 0·m070); whilst the height of those produced from the sand treated with the solution of the calcareous salts from bones, was 3⅛ to 4 inches (0·m080 to 0·m100); that is to say, the height of the latter was about a third more than the former.

On arriving at this stage of development, the plants appeared to decline, and the experiment was therefore stopped; they were withdrawn from the vessels, the roots cleansed from the sand which adhered to their surface, and the whole plant dried in a stove heated by steam.

The stalks produced from the experiment made with the solution of calcareous salt weighed, after perfect dessication, 0gr·193, whilst those from the second experiment only weighed 0gr·153; thus the height of the stems and their weight, in a dry state, were different under the two above-mentioned conditions; the difference being in favor of those produced in the sand treated with the water charged with the calcareous salts obtained from bones.

A third experiment, undertaken under the same conditions, produced precisely the same results.

The results obtained from the above experiments, shewing, as they do, the degree of influence which should be attributed to the calcareous salts in solution in the water, and to the carbonic acid, afford satisfactory explanation of the action of certain manures mixed with the soil. Besides the gaseous and ammoniacal products which are disengaged by the animal matters during decomposition, the calcareous salts (phosphates and carbonates) which they contain, in greater or less quantity, play a no less important part in the assimilation of vegetables. These mineral

compounds being necessary for the complete development of certain vegetables, it is requisite that they should obtain, by absorption, a portion of the calcareous salts in the manure mixed with the soil, or which originally formed constituents of the soil.

The facts observed in these experiments throw a light upon one point of vegetable physiology, which is, that certain calcareous salts, either neutral or basic, insoluble by themselves in pure water, may be incorporated into and form a constituent part of the organs and tissues of plants, after having been dissolved by water holding carbonic acid in solution. Vegetable life, when studied in its various modified forms, tends more and more to demonstrate the fact, that all organic bodies are in a state of dependance one upon the other.—[*Comptes Rendus.*]

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1849.

Feb. 24. *William Wilson*, of 50, King-street, Manchester, ironmonger, for a triple bath tap.

26. *James Badcock*, of Acacia cottage, Downham-road, London, for a hook for fastening garments.

27. *Edward Bird*, of Birmingham, for a lamp for railway carriages.

27. *Charles Eagle & John Egginston*, of Birmingham, for a fastening for articles of dress.

Mar. 1. *John St. Clark*, of Wolverhampton, for Remington and Clark's elastic bed laths.

2. *Theodore de Marillac*, of Manchester, for an oil-can.

2. *Henry M'Evoy*, of Birmingham, for the point of a wire dress hook.

3. *John Lee Benham*, of 170, Regent-street, London, for a chair with a moveable back.

5. *Charles Wright*, of 21, Sloane-square, Chelsea, for an invisible revolving tip for boots and shoes.

5. *Andrew Bertram*, of 75, Mitchell-street, Glasgow, smith, for an economic hot water apparatus.

6. *Clay & Son*, of Nuneaton, for a folding meat-hastener and plate warmer.

7. *David Thomson*, of Engine Works, Belgrave-road, Pimlico, for an improvement in bucket pumps.

9. *Isabella Lambert*, of 81, Market-street, Manchester, gentleman's outfitter, for the universal gaiter safeguard.

Mar. 9. *Enoch Oldfield Tindall & Lorenzo Tindall, or firm of E. O. & L. Tindall*, of Scarborough, in the county of York, ironmongers, for a vertical mangle, with horizontal spring pressure.

9. *Westley Richards*, of Birmingham, for a percussion cap.

10. *William Simpson*, of the Engine Works, Belgrave-road, London, for an improvement in water-valves or hydrants for supplying water from pipes in which it is contained.

10. *John Edward Smith*, of 3, Lawrence-lane, Cheapside, London, for a combination shirt waistcoat.

10. *David Burges*, of Portugal-street, Glasgow, brass founder, for a water pressure regulator.

10. *Charles Cave Williams*, of the Railway Carriage Works, Glasshouse-yard, Goswell-street, for an improved buffing and drawing apparatus for railway passenger carriages and waggons.

13. *William Powell*, of Temple-gate, Bristol, for a fastening for air-tight or other stoppers for jars, bottles, &c.

14. *Isaac Parkes*, of Birmingham, for a pen-holder.

15. *William Powell*, of Temple-gate, Bristol, for an air-tight stopper for jars, bottles, &c.

15. *Richard Easthope*, of Birmingham, for a cork extractor.

17. *Thomas Eldrid*, of 21, Fore-street, Cripplegate, London, for a sandwich case.

17. *John Fernihough & Sons*, of Victoria Boiler Works, Dukinfield, for a steam-boiler.

17. *W. & A. Munro*, of Broughton-market, Edinburgh, coach builders, for a locking-wheel.

17. *Henry Smith & Thomas Willey*, of Windsor Foundry, Liverpool, for switches for tram railroads.

20. *John Young*, of Wolverhampton, for a lock sash fastener.

21. *Joseph Sayce*, of 53, Cornhill, for the "Pimua" coat.

23. *John White Little*, of Bath, for a passenger's luggage label.

24. *William Burgess*, of 250, Blackfriars-road, London, for the gutta-percha tap ferrule.

26. *John Fuller & Co.*, of 95 and 96, Long-lane, Southwark, London, for the *bonâ fide* ventilating hat.

26. *Peter Rothwell Jackson*, of Salford Rolling Mills, Hampson-street, Salford, Lancashire, engineer, for for an improved railway waggon, for transporting minerals and other substances.

List of Patents

That have passed the Great Seal of IRELAND, from the 17th February to the 17th March, 1849, inclusive.

To William Martin, of St. Pierre les Calais, in the Republic of France, mechanist, for certain improvements in machinery for figuring textile fabrics; parts of which improvements are applicable to playing certain musical instruments, and to printing, and other like purposes.—Sealed 21st February, 1849.

List of Patents

Granted for SCOTLAND, subsequent to February 22nd, 1849.

To Lemuel Wellman Wright, of Chalford, in the county of Gloucester, civil engineer, for certain improvements in preparing various fibrous substances for spinning, and in machinery and apparatus connected therewith.—Sealed 27th February.

Michael Loam, of Treskerley, in the parish of Gwennap, in the county of Cornwall, engineer, for improvements in the manufacture of fusees.—Sealed 28th February.

William Edward Newton, of the Office for Patents, 66, Chancery Lane, in the county of Middlesex, civil engineer, for a certain improvement or improvements in the construction of wheels,—being a communication.—Sealed 5th March.

Robert Jobson, of Holly Hall Works, near Dudley, in the county of Stafford, engineer, for improvements in the manufacture of stoves.—Sealed 5th March.

John Smith, of Hare Craig, Dundee, factor to Lord Douglas of Douglas, for improvements in the manufacture of flour, applicable in the making of bread, biscuits, and pastry.—Sealed 6th March.

William Edwards Staite, of Throgmorton-street, in the City of London, civil engineer, for improvements in the construction of galvanic batteries, in the formation of magnets, and in the application of electricity and magnetism for the purpose of lighting and signalizing; as also, a mode or modes of employing the said galvanic batteries, or some of them, for the purpose of obtaining chemical products.—Sealed 7th March.

Charles Thomas Pearce, of Park Road, Regent's Park, in the county of Middlesex, Esq., for improvements in apparatus for obtaining light by electric agency.—Sealed 7th March.

Richard Laming, of Clichy la Garenne, in the Republic of France, chemist, for improvements in the modes of obtaining or manufacturing sulphuric acid,—being partly a communication.—Sealed 9th March.

George Nasmyth, of Great George-street, in the City of Westminster, civil engineer, for certain improvements in the construction of fire-proof flooring and roofing; which improvements

are also applicable to the construction of viaducts, aqueducts, and culverts.—Sealed 12th March.

Thomas Henry Russell, of Wednesbury, patent tube manufacturer, and John Stephen Woolrich, of Birmingham, chemist, for improvements in coating iron and certain other metals and alloys of metals.—Sealed 13th March.

George Fergusson Wilson, of Belmont, Vauxhall, Gent., for improvements in separating the more liquid parts from the more solid parts of fatty and oily matters, and in separating fatty and oily matters from foreign matters, and in the manufacture of candles and night lights.—Sealed 13th March.

Charles Robert Collins, of Brunswick-street, in the City of Glasgow, North Britain, paper manufacturer, for a certain improvement or improvements in the manufacture of paper.—Sealed 14th March.

John Hick, of Bolton-le-Moors, in the county of Lancaster, engineer, and William Hodgson Gratrix, of Salford, in the county of Lancaster, engineer, for certain improvements in steam-engines,—which improvements are more particularly applicable to marine engines; and also improvements in machinery or apparatus for propelling vessels.—Sealed 16th March.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in engines or apparatus, principally designed for pumping water,—being a communication.—Sealed 19th March.

William Galloway, and John Galloway, of Knott Mill Ironworks, Hulme, in the borough of Manchester, and county of Lancaster, engineers, for certain improvements in steam-engines.—Sealed 21st March.

Thomas Robinson, of Leeds, in the county of York, flax-dresser, for improvements in machinery for breaking, scutching, cutting, hackling, dressing, combing, carding, drawing, roving, spinning, and doubling flax, hemp, tow, wool, silk, and other fibrous substances, and in uniting fibrous substances.—Sealed 21st March.

New Patents
SEALED IN ENGLAND.
1849.

To Clemence Augustus Kurtz, of Wandsworth, in the county of Surrey, Gent., for certain improvements in looms for weaving, —being a communication. Sealed 28th February—6 months for inrolment.

Obed Blake, of the Thames Plate Glass Company, Blackwall, in the county of Middlesex, manager, for certain improvements in the process or processes of manufacturing and finishing plates, sheets, or panes of glass. Sealed 28th February—6 months for inrolment.

Joseph Barker, of Esher-street, Kennington, in the county of Surrey, artist, for an improved method of constructing umbrellas and parasols. Sealed 28th February—6 months for inrolment.

John Hick, of Bolton-le-Moors, in the county of Lancaster, engineer, and William Hodgson Gratrix, of Salford, in the county of Lancaster, engineer, for certain improvements in steam-engines,—which improvements are more particularly applicable to marine-engines;—and also improvements in machinery or apparatus for propelling vessels. Sealed 28th February—6 months for inrolment.

Benjamin Biram, of Wentworth, in the county of York, Gent., for improvements in miners' lamps. Sealed 28th February—6 months for inrolment.

Dion de Boncicault, of the Quadrant, Regent-street, in the county of Middlesex, Gent., for certain improvements in the mode or modes to be used for transmitting and distributing liquids and fluids for agricultural purposes, and for apparatus connected therewith. Sealed 28th February—6 months for inrolment.

Thomas Rowlandson, of Liverpool, chemist, for improvements in the treatment of certain mineral waters to obtain products therefrom; and in obtaining certain metals from certain compounds containing those metals; and in obtaining other products by the use of certain compounds containing metals. Sealed 28th February—6 months for inrolment.

Charles André Felix Rochaz, of New-court, St. Swithin's-lane, in the City of London, merchant, for improvements in the manufacture of oxide of zinc, and in the making of paints and cements, when oxide of zinc is used. Sealed 28th February—6 months for inrolment.

Pierre Isidor David, of Paris, in the Republic of France, for improvements in bleaching cotton. Sealed 28th February—6 months for inrolment.

Job Cutler, of Spark Brook, near Birmingham, in the county of Warwick, civil engineer, for certain improvements in the manufacture of metal pipes or tubes. Sealed 28th February—6 months for inrolment.

George Fergusson Wilson, of Belmont, Vauxhall, Gent., for improvements in separating the more liquid parts from the more solid parts of fatty and oily matters, and in separating fatty and oily matters from foreign matters. Sealed 28th February—6 months for inrolment.

Robert Pollard, of Topsham, in the county of Devon, ropemaker, for an improvement in ropemaking machinery. Sealed 28th February—6 months for inrolment.

Henry Crosley, of the firm of Henry Crosley, Son, and Golsworthy, of Emerson-street, in the county of Surrey, engineers and coppersmiths, for certain improved modes or methods of, and apparatus for, heating and lighting, for dry-

ing substances, and for employing air in a warm and cold state for manufacturing purposes. Sealed 28th February—6 months for inrolment.

Perceval Moses Parsons, of Lewisham, in the county of Kent, civil engineer, for certain improvements in railways, railway engines and carriages, and certain of their appurtenances. Sealed 28th February—6 months for inrolment.

Amedee François Rémond, of Birmingham, for improvements in machinery for folding envelopes, and in the manufacture of envelopes. Sealed 28th February—6 months for inrolment.

William Brindley, of Twickenham, papier-mâché manufacturer, for improvements in the manufacture of waterproof paper. Sealed 28th February—6 months for inrolment.

Charles Jacob, of Nine Elms, in the county of Surrey, engineer, for improvements in the manufacture of earthenware tubes or pipes. Sealed 28th February—6 months for inrolment.

Edward Westhead, of Manchester, manufacturer, for certain improvements in the manufacture of waddings. Sealed 3rd March—6 months for inrolment.

Henry Constantine Jennings, of Abbey-street, Bermondsey, practical chemist, for improvements in the manufacture of vehicles for mixing pigments, and also in the manufacture of white lead. Sealed 5th March—6 months for inrolment.

Nathan Defries, of Grafton-street, Fitzroy-square, civil engineer, and George Brooks Pettit, of Brook-street, New-road, in the county of Middlesex, gas fitter, for improvements in applying gas to heat apparatus containing fluids, and in heating and ventilating buildings; also improvements in gas fittings and apparatus for controlling the passage of gas. Sealed 5th March—6 months for inrolment.

William Henry Balmain and Edward Andrew Parnell, both of St. Helen's, in the county of Lancaster, manufacturing chemists, for improvements in the manufacture of glass, and in the preparation of certain materials to be used therein; parts of which improvements are also applicable to the manufacture of alkalies. Sealed 5th March—6 months for inrolment.

Samuel Banks, of West Leigh, in the county of Lancaster, miller, for certain improvements in mills for grinding wheat and other grain. Sealed 5th March—6 months for inrolment.

William Henry Green, of Basinghall-street, in the City of London, Gent., for improvements in the preparation of fuel,—being a communication. Sealed 5th March—6 months for inrolment.

James Baird, of Gartsherrie, in the county of Lanark, in Scotland, iron master, and Alexander Whitelaw, of the same place, manager, for improvements in the method or process of manufacturing iron. Sealed 7th March—6 months for inrolment.

Andrew Shanks, of Robert-street, Adelphi, engineer, for an improved mode of giving form to certain metals when in a fluid or molten state. Sealed 14th March—6 months for inrolment.

John Smith, of Hare Craig, Dundee, factor to Lord Douglas of Douglas, for improvements in the manufacture of flour, applicable to the making of bread, biscuits, and pastry. Sealed 14th March—6 months for inrolment.

Robert Ross Rowan Moore, of the Temple, barrister-at-law, for improvements in the manufacture of letters and figures, to be applied to shop-fronts and other surfaces. Sealed 14th March—6 months for inrolment.

George Fergusson Wilson, of Belmont, Vauxhall, in the county of Surrey, Gent., for improvements in the manufacture of candles and night-lights. Sealed 14th March—6 months for inrolment.

James Williamson Brooke, of Camden-town, Gent., for improvements in lamps. Sealed 14th March—6 months for inrolment.

Thomas Clarke, of Hackney, in the county of Middlesex, engineer, and Thomas Motley, of the City of Bristol, civil engineer, for certain improvements in obtaining and applying motive power; also improvements in railroads and other roads; and in supporting pressure, resisting strain, and protecting against fire. Sealed 14th March—6 months for inrolment.

Robert Plummer, of the town of Newcastle-on-Tyne, manufacturer, for certain improvements in machinery, instruments, and processes employed in the preparation and manufacture of flax and other fibrous materials. Sealed 14th March—6 months for inrolment.

William Payne, of New Bond-street, in the county of Middlesex, watch and pedometer maker, for certain improvements in clocks and watches. Sealed 14th March—6 months for inrolment.

Alexander Swan, of Kirkaldy, in the county of Fife, manufacturer, for improvements in heating apparatus, and in applying hot and warm air to manufacturing and other purposes where the same are required. Sealed 14th March—6 months for inrolment.

William Gratrix, of Salford, in the county of Lancaster, bleacher and dyer, for certain improvements in the method or process of drying and finishing woven and other fabrics, and in the machinery or apparatus for performing the same,—part of which improvements is applicable to stretching woven fabrics. Sealed 14th March—6 months for inrolment.

Ignacio de Barros, of Lisbon, in the Kingdom of Portugal, but now residing in Paris, in the Republic of France, Gent., for improvements in machinery for making lasts for boots and shoes, butts or stocks for fire-arms, and other irregular forms. Sealed 14th March—6 months for inrolment.

William Allen Bragg, of Queen's-row, Pentonville, bath-keeper, for improvements in propelling by atmospheric pressure. Sealed 14th March—6 months for inrolment.

Francis Hay Thomson, of Hope-street, in the City of Glasgow, North Britain, doctor of medicine, for an improvement or im-

provements in smelting copper or other ores. Sealed 14th March—6 months for inrolment.

Pierre Augustin Chaufourier, of Regent's-quadrant, merchant, for certain improvements in the manufacture of watches. Sealed 14th March—6 months for inrolment.

Pierre Armand le Comte de Fontainemoreau, of South-street, Finsbury, London, for certain improvements in coating metallic and non-metallic bodies. Sealed 14th March—6 months for inrolment.

Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman, for improvements in the manufacture of piled fabrics. Sealed 19th March—6 months for inrolment.

Joseph Béranger, of the firm of Béranger and Co., of Lyons, in the Republic of France, civil engineer, for improvements in weighing-machines. Sealed 19th March—6 months for inrolment.

Thomas Henry Russell, of Wednesbury, patent tube manufacturer, and John Stephen Woolrich, of Birmingham, chemist, for improvements in coating iron and certain other metals and alloys of metals. Sealed 19th March—6 months for inrolment.

Samuel Hall, of King's Arms Yard, Coleman-street, in the City of London, civil engineer, for improvements in apparatus for effecting the combustion of fuel and consuming smoke, and for preventing explosions of steam-boilers and other accidents to which they are liable. Sealed 19th March—6 months for inrolment.

George Knox, of Moorgate-street, in the City of London, secretary to the Shrewsbury and Birmingham Railway Company, for improvements in railway carriages. Sealed 19th March—6 months for inrolment.

Alexander McDougall, of Longsight, in the county of Lancaster, chemist, for improvements in recovering useful products from the water used in washing, and in treating wool, woollen, and cotton fabrics, and other substances. Sealed 20th March—6 months for inrolment.

Charles William Harrison Pickering, of Liverpool, merchant, for improvements in evaporating brine and certain other fluids. Sealed 20th March—6 months for inrolment.

Charles William Siemens, of Birmingham, engineer, for certain improvements in engines to be worked by steam and other fluids, and in evaporating liquids. Sealed 20th March—6 months for inrolment.

William Parkinson, of Cottage-lane, City-road, in the county of Middlesex, gas-meter manufacturer, successor to the late Samuel Crosley, for improvements in gas and water-meters, and in in-instruments for regulating the flow of fluids. Sealed 20th March—6 months for inrolment.

John Mackintosh, of Bedford-square, for improvements in furnaces and machinery for obtaining power, and in regulating,

measuring, and registering the flow of fluids and liquids. Sealed 24th March—6 months for inrolment.

David Henderson, of the London Works, Renfrew, Scotland, engineer, for improvements in the manufacture of metal castings. Sealed 26th March—6 months for inrolment.

Alexander Parkes, of Harborne, in the county of Stafford, chemist, for improvements in the deposition and manufacture of certain metals and alloys of metal; and improved modes of treating and working certain metals and alloys of metals; and in the application of the same to various useful purposes. Sealed 26th March—6 months for inrolment.

Stephen White, of Victoria-place, Bury New-road, Manchester, gas-engineer, for improvements in the manufacture of gases, and in the application thereof to the purposes of heating and consuming smoke; also improvements in furnaces for economizing heat, and in apparatus for the consumption of gases. Sealed 26th March—6 months for inrolment.

John Mason, of Rochdale, in the county of Lancaster, machine-maker, and George Collier, of Barnsley, in the county of York, manager, for certain improvements in machinery or apparatus for preparing and spinning cotton and other fibrous materials; and also improvements in the preparation of yarns or threads and in the machinery or apparatus for weaving the same.—Sealed 26th March—6 months for inrolment.

George Thomson, of Camden-road, cabinet-maker, and James Elmes, of the New-road, Gent., for improvements in machinery for cutting and tying-up fire-wood. Sealed 28th March—6 months for inrolment.

William Buckwell, of the Artificial Granite Works, Battersea, Surrey, civil engineer, for improvements in compressing or solidifying fuel and other materials. Sealed 28th May—6 months for inrolment.

Richard Satchell, of Rockingham, in the county of Northampton, for improvements in machinery for depositing seeds and hoeing and working land. Sealed 28th March—6 months for inrolment.

Pierre Rene Guerin, of Havre, for improvements in steering ships and other vessels. Sealed 28th March—6 months for inrolment.

Charles Green, of Birmingham, patent brass tube manufacturer, and James Newman, of Birmingham, manufacturer, for improvements in the manufacture of railway wheels. Sealed 28th March—6 months for inrolment.

George Henry Manton, of Dover-street, Piccadilly, gun-maker, and Josiah Harrington, of Regent's-circus, gun-maker, for improvements in priming, and in apparatus for discharging firearms. Sealed 28th March—6 months for inrolment.

François Vouillon, of Princes-street, Hanover-square, manufacturer, for improvements in making hats, caps, and bonnets. Sealed 28th March—6 months for inrolment.

William Hartley, of Bury, in the county of Lancaster, engineer, for certain improvements in steam engines. Sealed 28th March—6 months for inrolment.

Frederick William Norton, of Lascelles Hall, Lepton, parish of Kirkheaton, and county of York, fancy cloth manufacturer, for certain improvements in the production of figured fabrics. Sealed 28th March—6 months for inrolment.

Osborne Reynolds, of Dedham, in the county of Essex, clerk, for certain improvements in railways. Sealed 28th March—6 months for inrolment.

Thomas Harrison, of Liverpool, merchant, for certain improvements in the construction of baking-ovens, and also in certain machinery for working or using the same. Sealed 28th March—6 months for inrolment.

James Thomson Wilson, of Glasgow, for improvements in the manufacture of sulphuric acid and alum. Sealed 28th March—6 months for inrolment.

James Fletcher, of Salford, in the county of Lancaster, manager at the works of Messrs. William Collier and Co., of Salford aforesaid, machinists and toolmakers, and Thomas Fuller, of the same place, machinist and toolmaker, partner in the said firm, for certain improvements in machinery, tools, or apparatus for turning, boring, planing, and cutting metal and other materials. Sealed 28th March—6 months for inrolment.

James Lawrence, the elder, of Colnbrook, in the county of Middlesex, brewer, for an improvement or improvements in brewing worts for ale, porter, and other liquors, and in storing ale, porter, and other liquors. Sealed 28th March—6 months for inrolment.

John Britten, of Birmingham, manufacturer, for certain improvements in the means, apparatus, and appliances for cooking, preserving, preparing, and storing drinks and articles of food, and in preparing materials for constructing the same; also in constructing vertical roasting-jacks and chains for the same, applicable to other chains; parts of which improvements are applicable to other similar purposes. Sealed 28th March—6 months for inrolment.

William Beckett, of Northwick, in the county of Cheshire, draper, and Samuel Powell, of Witton-Northwick, in the same county, foreman, for certain improvements in the manufacture, making, or construction of certain articles of wearing apparel. Sealed 28th March—6 months for inrolment.

Henry Howard, of Railway-place, Fenchurch-street, for certain improvements in the manufacture of glass; also in the construction of furnaces for melting and fining the same. Sealed 28th March—6 months for inrolment.

CELESTIAL PHENOMENA FOR APRIL, 1849.

D.	H.	M.	
1			Clock before the ⊙ 3m. 56s.
—			☽ rises 11h. 47m. M.
—			☽ pass. mer. 7h. 32m. A.
—			☽ sets 2h. 26m. M.
2	4	42	♃ in conj. with the ☽ diff. of dec. 3. 38. N.
3	14	3	♃'s first sat. will em.
5			Occul. *B* in Virginis, im. 6h. 45m. em. 7h. 54m.
—			Clock before the ⊙ 3m. 2s.
—			☽ rises 4h. 23m. A.
—			☽ passes mer. 10h. 52m. A.
—			☽ sets 4h. 44m. M.
	8	32	♃'s first sat. will em.
6	7	30	♃'s second sat. will em.
	16	7	♀ at greatest brilliancy
	—		Occul. 38 Virginis, im. 16h. 26m.
7	3	50	Ecliptic oppo. or ○ full moon
	11	6	♃'s second sat. will em.
8	1	35	♃ stationary.
9			Ceres in the descending node
10			Occul. 49 Libræ, im. 13h.
—			Clock before the ⊙ 1m. 18s.
—			☽ rises 9h. 48m. A.
—			☽ passes mer. 1h. 52m. M.
—			☽ sets 6h. 51m. M.
11	4	9	☿ in conj. with ♄ diff. of dec. 0. 27. S.
	19	13	♅ in conj. with the ⊙
	22	0	☽ in Apogee
12	10	26	♃'s first sat. will em.
13	7	56	♃'s third sat. will im.
	11	29	♃'s third sat. will em.
14	13	43	♃'s second sat. will em.
	21	28	☿ greatest hel. lat. S.
	—		Occul. B.A.C. 6658 im. 17h. 38m.
15			Clock after the ⊙ 0m. 1s.
—			☽ rises 1h. 18m. M.
—			☽ passes mer. 5h. 46m. M.
—			☽ sets 10h. 27m. M.
			Mercury R. A. 0h. 30m. dec. 0. 41. N.
—			Venus R. A. 3h. 43m. dec. 25. 46. N.
—			Mars R. A. 22h. 29m. dec. 10. 55. S.
—			Vesta R. A. 2h. 42m. dec. 11. 14. N.
—			Juno R. A. 6h. 36m. dec. 13. 52. N.
15			Pallas R. A. 18h. 17m. dec. 17. 8. N.
—			Ceres R. A. 18h. 53m. dec. 23. 11. S.
—			Jupiter R. A. 9h. 1m. dec. 17. 59. N.
—			Saturn R. A. 0h. 8m. dec. 1. 21. S.
—			Georg. R. A. 1h. 23m. dec. 8. 12. N.
—			Mercury passes mer. 22h. 58m.
—			Venus passes mer. 2h. 8m.
—			Mars passes mer. 20h. 54m.
—			Jupiter passes mer. 7h. 26m.
—			Saturn passes mer. 22h. 31m.
—			Georg. passes mer. 23h. 46m.
	7	8	☽ in □ or last quarter
18	16	4	♂ in conj. with the ☽ diff. of dec.
19	12	21	♃'s first sat. will em.
20			Clock after the ⊙ 1m. 10s.
—			☽ rises 4h. 3m. M.
—			☽ passes mer. 9h. 52m. M.
—			☽ sets 3h. 51m. A.
	9	27	♄ in conj. with the ☽ diff. of dec. 0. 17. S.
	11	56	♃'s third sat. will im.
	23	30	♀ stationary
21	12	48	☿ in conj. with the ☽ diff. of dec. 1. 23. N.
	18	4	♅ in conj. with the ☽ diff. of dec. 2. 58. N.
22	11	54	Ecliptic conj. or ● new moon
23			Pallas stationary
	7	43	☿ in conj. with ♅ diff. of dec. 1. 9. S.
	22		☽ in Perigee
24	3	28	♀ in conj. with the ☽ diff. of dec. 11. 3. N.
25			Clock after the ⊙ 2m. 9s.
—			☽ rises 6h. 47m. M.
—			☽ passes mer. 2h. 30m. A.
—			☽ sets 10h. 21m. A.
28	8	45	♃'s first sat. will em.
29	2	17	☽ in □ or first quarter
	11	13	♃ in conj. with the ☽ diff. of dec. 3. 22. N.
30			Clock before the ⊙ 2m. 55s.
—			☽ rises 11h. 57m. M.
—			☽ passes mer. 7h. 14m. A.
—			☽ sets 1h. 49m. M.

J. LEWTHWAITE, Rotherhithe.

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RECENT PATENTS.

To Samuel Thornton, *of Birmingham, in the county of Warwick, merchant, and* James Edward Mc Connell, *of Wolverton, in the county of Buckingham, engineer, for improvements in steam-engines, and in the means of retarding engines and carriages on railways, and in connecting railway carriages or waggons together; also improvements in effecting a communication between one part of a railway train and another, by signals or otherwise.*—[Sealed 7th August, 1848.]

This invention, so far as it relates to improvements in steam-engines, consists, firstly, in an improved construction of piston; secondly, in certain alterations in the chimney and blast-pipe; and thirdly, in certain arrangements and alterations of the eduction-passages and valves, for the purpose of diminishing the back pressure, or the resistance of the steam in the eduction-passages to the motion of the piston.

The improvement in the piston consists in a certain arrangement and combination of parts, for the purpose of ensuring uniformity of pressure on the rubbing surface of the piston.

In Plate X., the improved piston is shewn in cross section at fig. 1, and in plan view at fig. 2. The novelty consists in the adoption of one or two packing-rings A, A, which are of a form to allow of a projection towards the interior of the piston, having the surface conical at B, B; on which conical surfaces two inner rings C, C, are accurately fitted, in such a manner as to act easily to and fro;—the expansion of the outer or packing-rings being allowed for by their being cut asunder

in the usual manner, as at D, D, fig. 2. The inner rings are not cut; but, being concentric with the outer rings, they are made to fit closely against the conical surfaces B, by the elastic pressure of a spiral spring F, which allows of their taking a position suitable to the varying diameter of the rings A. On each of the inner rings C, there is fitted one of two thin elastic discs E, E, of tempered cast-steel, for the purpose of receiving the pressure of the spring F, which causes the inner rings C, C, to act on the outer or packing-rings, as before mentioned, and thus render the rubbing surface steam, water, or air-tight. Instead of the two discs being pressed from each other by means of the spiral spring F, a spring of India-rubber or other elastic substance, placed in the centre of the rings round the piston-rod, may be employed for that purpose.

In this arrangement of the piston, the rings may, by means of pins or holders, at relative distances in the piston, be shifted round, so as to wear equally, and prevent the formation of ridges or marks in the cylinder or packing. The piston may be also made of wrought-iron or steel, in one piece with the piston-rod, and with the adoption of one breadth of packing, so that the piston may be as light as possible. Under this division of their invention, the patentees claim the construction of pistons above described, in which the packing-rings are adjusted by means of two conical surfaces, acted on by a spring and elastic discs.

The second improvement, relating to steam-engines, consists in certain alterations in the chimney and blast-pipe of locomotive engines, and is intended to obtain, from the escaping steam, an effectual means of accelerating the ingress of atmospheric air to the furnace, and at the same time increase the effective force of the steam acting upon the pistons. It is generally known that the quantity of steam which escapes, at the usual pressure, from the smallest cylinders of any engine used on railways, is sufficient to eject the air from the chimney; and it has been the usual practice to vary the diameter of the chimney in a certain proportion to the diameter of the cylinders of an engine, and to preserve a nearly uniform height for the chimney: namely, the greatest which the bridges over any particular railway would admit. Now, the object of this part of the invention is to obtain the advantage of a chimney of a height incompatible with the ordinary working of a railway, limited as such height is by the headway of the bridges; and this is effected by adopting two or more shafts, instead of one, as the chimney, into which shafts

the steam is discharged simultaneously from a corresponding number of blast-pipes.

Fig. 3, is a vertical section, and fig. 4, a plan view of a chimney, having three shafts *a, a, a,* say five feet long each. Into these shafts three blast-pipes *b, b, b,* convey exhaust steam simultaneously; which, being discharged at the top of the chimney, will cause a rapid in-draft of air to the furnace.

The patentees do not confine themselves to the particular arrangement shewn in the drawing; but they intend to use two, three, four, or more shafts for the chimney, with a corresponding number of blast-pipes, and of dimensions according to the quantity of steam to be discharged. They claim the division of the chimney into several shafts, into which a like number of blast-pipes exhaust simultaneously, as above described.

The third improvement in steam-engines, which consists of an improved arrangement of the eduction-passages and steam-valves in high-pressure engines, for the purpose of increasing the effective power of the steam, is shewn in longitudinal section at fig. 5, and in cross section at fig. 6. To all persons acquainted with the working of steam-engines, it will be evident that a great saving of power and consequent economy will result from diminishing the back pressure of eduction steam on the piston; or, in other words, much of the power now expended in expelling the steam from the cylinder, after it has performed the operation of pressing the piston to the end of the stroke, will be saved, if the passage for this eduction steam is rendered more direct and capacious than according to the arrangements at present adopted. In order to accomplish this, the patentees have arranged the eduction-passages and valves as shewn at figs. 5, and 6. A, represents the present cylinder, as in use on a locomotive engine; B, the slide-valves of the engine; C, C, the valve-spindles; D, the steam-passages; and E, the eduction-passage. In addition to this (the ordinary arrangement), another eduction-passage from the cylinder to the atmosphere is provided at each end of the cylinder, as shewn at F, F, F; and this passage may be placed as found convenient, either exactly opposite the opening from the interior of the cylinder, or at any intermediate distance between that and the passage which admits the steam. The valves are also somewhat differently arranged, as one valve G, at each end, is used for the purpose of regulating the emission of the steam from the cylinder. These valves G, G, are attached to the same spindle C, C, as the ordinary steam-valve, and are moved simultaneously with it. In order to explain the ope-

ration of the above, it is proper to state that the valve G, at either end, is so placed that it is open to the atmosphere from the cylinder at the same instant that the eduction steam, from the same end of the cylinder at which the said valve is placed, is escaping by the ordinary passages to the atmosphere. The size of the passage for steam, next to the interior surface of the cylinder, as shewn at H, H, should be increased, in order to allow for the increased area of the eduction-pipes, caused by the additional passages through the valves G, G. I, I, represent the two blast-pipes for taking the eduction steam to the chimney; and the arrangement of these pipes, and also the plans of packing the back of the valves, may be varied according to the circumstances and particular construction of the engine to which they may be applied. It will be obvious that a similar arrangement of valves and eduction-passages, for increasing the area for the passage of eduction steam, may be adapted to any of the various kinds of engines in which high-pressure steam is employed, as well as in locomotive engines.

It will be understood that, by the arrangement of passages and valves as described, the pressure in the blast-pipe and eduction-passages will be diminished, so as to admit of a diminution of the back pressure or resistance to the motion of the piston. The patentees claim the constructing and arranging of the eduction-passages and valves in the manner above described and represented.

The second head of this invention relates to improvements in connecting railway carriages or waggons together; and consists, firstly, in an improved method of coupling; and, secondly, in improved arrangements of the buffers.

And first, as to the improved method of coupling the carriages and waggons together.—The object of the improved method of coupling is to obviate the present dangerous mode of coupling railway carriages and waggons, whereby the men employed to do that work are constantly liable to be crushed to death, or to receive serious injury, particularly when in the act of coupling merchandize or mineral waggons together. This is effected by preventing the necessity of a man going under, or standing between, the carriages or waggons, when in the performance of the duty of coupling them together or of uncoupling them.

Fig. 7, shews, in elevation, a carriage with the improved coupling apparatus applied thereto; and fig. 8, is a plan of the framing of the carriage, shewing also the arrangement of the coupling. A, A, A, are brackets, for supporting the rods

which carry the hook-links; B, B, are the hooks; C, C, the coupling-links, placed in their coupled position. At E, (see fig. 7,) the right-hand link is shewn as turned up uncoupled. F, F, are handles for working the coupling-links: they may be applied to the outside of the carriage or waggon as well as to the inside of the framing. H, H, are mitre or bevil wheels, for working the screws which draw the buffers of the carriages together.

Figs. 9, and 10, shew, in plan and side views, a modification of the above-described arrangements. A, A, are the brackets; B, B, the hooks; and C, and D, the links. The right-hand link D, is shewn as coupled; and the left-hand link C, falling down over the link D, to be coupled. F, are the handles, for working the coupling-links; H, is a worm-wheel, for drawing the buffers of the waggon together; I, is a shaft, with an endless screw, for working the worm-wheel; K, is a rod, for connecting the coupling-hooks to the springs under the carriages; and L, L, shew the handles for giving motion to the shaft I, which carries the endless screw for working on the worm-wheel and drawing up the carriages. Fig. 11, shews a plan for tightening the carriages from their centres, by making use of one worm-wheel and one shaft passing through from one side of the carriages to the other: this plan shews one-half of the movement. The patentees claim, with respect to the connecting of railway carriages and waggons together, the arrangement above described, whereby carriages may be coupled together or uncoupled from the outside, without the necessity of any person being between them.

The second improvement, under this head of the invention, consists in connecting railway carriages and waggons by means of an improved system of buffers, so as ensure uniformity in height of the same, whereby, whatever may be the position of the carriages or waggons, in respect of deflection of springs from load or other circumstances, the buffers will always be at the same distance from the rails, and in a line with each other both laterally and vertically: thus ensuring safety to the train in this particular, and also greater economy in the wear, and ease in the travelling of the carriages or waggons. This improvement consists in attaching the buffers to, or connecting them with, the axles, or a frame affixed to the axles, instead of the bodies of the carriages; by which means the buffers, or the line of their action, will maintain one and the same height from the surface of the rails, to whatever amount the carriages may be loaded. This method of arranging the buffers is shewn at fig. 12, and it will be obvious that, pro-

vided the buffers are attached to a frame affixed to or connected with the axles instead of to the carriage (the height of which from the rails is liable to variation according to the load and other circumstances), the line of the action of the buffers will be maintained. The patentees recommend that the buffer-rods should be hollow, and of wrought or drawn-iron tubing; but this is not essential. They claim, as an improvement in connecting railway carriages and waggons, the constructing and arranging the carriages and waggons so that they may be brought together by means of a system of buffers, framed to or connected with the axles, in such manner that the line of their action, when the carriages and waggons are coupled together, may be at one and the same height throughout the train, and independent of the loading of the carriages.

The third head of this invention relates to improvements in the means of retarding engines and carriages, and in effecting a communication between one part of a railway train and another by signal or otherwise; and consists, firstly, in certain arrangements for transmitting signals from one part of the train to another; and, secondly, in certain arrangements for bringing the breaks into action by or through the system of buffers. It is well known that various suggestions have, from time to time, been made for effecting or facilitating a communication between different parts of a train with certainty; and, amongst others, it was some time ago suggested by James Edward Mc Connell (one of the present patentees) that the carriages should be constructed with a continuous platform, so arranged that a guard might travel from one carriage to another while the train was in motion. But it is desirable that some more expeditious means should exist of communicating from one part of a train to another, and of bringing into action all the breaks throughout the train.

Now, the last described part of the invention, viz., the arrangement whereby the buffers or their line of action are preserved at one and the same height, affords the means of attaining the object; for, by employing hollow buffers, and carrying a chain through them, every carriage throughout the train may be communicated with, as will be readily understood from the following explanation:—At fig. 12, A, A, represent the guards' vans in front and rear of the train, with a carriage G, between them. B, B, are friction-wheels on the guards' vans, which are for the purpose of being brought into contact with the wheels of the van by means of the lever C, or screw-rod and handle H, in the other case, as may be most convenient, in order to draw the chains or rods through the

tubes of the buffers, to give the signal or signals. On the same axis as the friction-wheels or pulleys B, B, are placed or fixed several pulleys or barrels I, I, for the chain to be wound over. It will be evident that, on the friction-wheel being brought in contact with the wheel of the van or carriage, the motion will cause it to revolve, and the chain will be drawn over the small pulleys or barrels I, I; and this can be also done by various other plans, as may be considered more convenient and desirable.

By the adoption of the plan of hollow or tubular buffers, breaks may be applied to any or all of the wheels of the carriages or waggons in the train; for, by an arrangement shewn at figs. 12, and 13, the chain, rods, or rope (of suitable materials), extending through the buffer-tubes, is connected to levers or wheels, which act on the breaks when the chain is drawn tight. J, J, J, represent the levers, which are acted on by the chain by means of a toothed quadrant, working in the tube; and which levers are fixed to the breaks K, K, K. When the chain is drawn, the quadrants are moved, so as to bring the break to act on the wheel; and, when this is effected, the chain glides over the smooth end of the quadrants at L, L, L. The springs E, E, E, then force the small catches *o*, *o*, *o*, on the projecting stud *p*, (shewn by dots) on the levers, and the break is held in contact while the chain is further brought into and thrown on any of the other levers which may not have been affected.

Another mode of equalizing this action on the breaks is shewn at fig. 14. P, is a small lever, carrying, at its upper end, a pin, on which a small toothed wheel F, is so mounted that the cotter N, holds it fast, to bring the break into action by the wheel acting, in the first instance, like the quadrant of the former lever; but when the strain is sufficiently on the break, the cotter N, allows the small wheel to revolve on its axle; and the chain is then tightened on the other breaks in a similar way.

Various other plans can be adopted for bringing the chain to act equally and effectively on all the breaks of the train, or a lesser number, as may be considered necessary. The chain is represented by the dotted line D, D; and one or more chains, lines, wires, or other mediums of communication, may be introduced, as considered desirable, for signals, breaks, &c.; and when the carriages have been coupled up, the ends of the chains, rods, or other medium of communication, may be connected together through a slot or openings at each end of the

hollow buffer-rods. The various modifications of which this part of the invention is susceptible will be obvious.

The patentees claim, as their improvements in effecting a communication between one part of a railway train and another, the giving signals by means of a chain, line, wire, or other medium of communication, passing through hollow or tubular buffer-rods, and connected with different parts of a train, as above described; they also claim the means of retarding engines and carriages on railways by actuating the breaks by means of a chain or rope, passing through hollow or tubular buffer-rods, as above described.—[*Inrolled February*, 1849.]

To Thomas Restell, *of Tooting, in the county of Surrey, watchmaker, and* Richard Clark, *of the Strand, in the City of Westminster, lamp manufacturer, for improvements in chronometers, clocks, watches, or other time-keepers.*—[Sealed 11th May, 1848.]

This invention relates, firstly, to various improved modes of constructing and arranging the escapement part of clocks, watches, or other time-keepers, whereby, in some cases, the use of the detent and lifting springs, and, in others, the balance-spring, as well as the other parts connected therewith, are dispensed with. This invention relates, secondly, to certain improved arrangements of compensating balance-springs and balances or pendulums; and in improved modes of constructing certain of the parts in connection therewith. Thirdly, the invention relates to an improved mode of adapting musical boxes to clocks or time-keepers,—the object being to cause the box to play at stated intervals, as long as the clock continues going.

In Plate XI., several modes of carrying out the first part of the invention are shewn. Fig. 1, represents, in front view, and fig. 2, in side or edge view, one plan of making the escapement, in which the detent spring, the lifting spring, and compensating balance, are dispensed with; and, in place of adapting any compensation to the balance itself, as is usually the case, the compensating arrangement is adapted to the balance-spring, which, as is well known, becomes lengthened or shortened according to the variations in the temperature: this part of the improvements will, however, be hereafter more particularly explained under the second head of the invention.

In the arrangement of the several parts of the escapement shewn in figs. 1, and 2, it will be seen that the centres of the balance-wheel *a*, the escapement-wheel *b*, and the locking detent *c*, are all in a direct line. There is nothing peculiar in the construction of the pallet *p*, or of the escapement-wheel *b*, excepting that the latter is made with an even number of teeth. The curve or face of the locking detent must however be made of a particular form, in order to operate correctly. The manner of obtaining this curve, or rather compound curve, will be best understood by referring to the diagram fig. 3. Let 1, be supposed to represent the centre of the escapement-wheel, and the curve from 2, to 3, the path traversed by the extreme edge of the teeth of the escapement-wheel; the dotted line from 1, to 4, will therefore represent the radius of the latter, and one-half of the curve of the detent will be concentric with the periphery of the escapement-wheel; but, in order that the detent should be made to lock against the teeth of the escapement, the remaining part of the curve is produced by shifting the centre of the curve a little on one side of the centre of the escapement-wheel, as shewn at 5; then, by striking a curve of the same radius in continuation of the first, the second half of the curve will be brought inward, as seen at 6; and the face of the detent will be made to consist of the compound curve shewn in the diagram. The back part of the detent may of course be made of any convenient shape, as it does not affect the action of the escapement.

The patentees prefer to arrange the pallet *p*, escapement-wheel *b*, and detent *c*, in a right line; but a similar effect may be produced even when one or other of these parts is placed on one side. The pivot of the detent *c*, carries an arm or lever *d*; the end of which (see the detached views of the detent and lever at figs. 1*,) is furnished with a ruby pin, flat on one side and round on the other;—and the balance *a*, is furnished with a thin spring *e*; one end of which is fastened to the inside of the balance between the arms, while the other is bent outwards, and projects through a hole or slot cut in the periphery of the balance, as shewn at fig. 1. As the balance-wheel *a*, moves in the direction of the arrow, the point 7, of the spring *e*, will come against the flat side of the ruby pin of the lever or arm *d*, and unlock the detent *c*, and allow one tooth of the escapement-wheel *b*, to pass along the curve of detent: from the peculiar form of the curve of the detent the tooth of the escapement-wheel will pass freely along one-half of the curve; but, immediately that it passes

the centre, it will act against the second part of the curve and depress it,—thereby lifting up the opposite side to its original position, and causing it to lock against the following tooth. The patentees remark that, although they prefer the face of the detent to be a compound curve, such as that shewn at fig. 3, yet it is not absolutely necessary; as the second portion of it, or that from 4, to 6, if made flat, will act satisfactorily. When the locking is completed, and the balance makes its return vibration, the point 7, of the spring *e*, strikes against the round side of the ruby pin of the arm or lever *d*, and passes over without affecting or unlocking the detent. In order to prevent confusion in the drawing, no balance-spring is shewn applied to this escapement, although one will be required. For this purpose, the patentees prefer to employ the improved compensating balance-spring hereafter described under the second head of their invention.

Fig. 4, represents, in plan view, and fig. 5, in side or edge view, another arrangement of escapement. In this, as in the former instance, the pallet *p*, the balance *a*, the escapement-wheel *b*, and the detent *c*, are all in a line; but, in this case, the balance or pendulum-spring is also dispensed with, as well as the lifting and detent springs, and compensating balance; and the balance, at every beat, is made to describe exactly one revolution, and then stop until it receives a second impulse; so that it will always rotate in one and the same direction. The notch in the pallet *p*, is cut to a curve, corresponding with the periphery of the escapement-wheel; and the face of the detent *c*, is formed of a compound curve, or is partly curved and partly flat, as in the first arrangement.—Projecting from the top side of the detent is a banking-piece 8. The corner 9, of the detent, against which the teeth of the escapement-wheel lock, is cut away, as shewn in the enlarged detached views figs. 4*, for the purpose hereafter explained. The axle or pivot of the detent carries a small tappet or pallet *i*, against which a pin or stud *g*, on one of the arms of the balance, acts. Another stud or pin *h*, is fixed in the underside of the periphery of the balance; and, when the balance is in a quiescent position, this pin rests against a spring-piece *j*. Let it now be supposed that the balance has received an impulse:—The pin *h*, will force back the spring *j*, into the position shewn by dots at fig. 4, and the balance will continue its rotation until the pin *h*, again comes in contact with the spring *j*, by which it will be stopped suddenly; at the same time the other pin *g*, on the arm of the balance, will strike against the tappet or pallet *i*, of the detent, and force it back

just enough to liberate the escapement-tooth from the locking; then the extreme edge of this tooth will act against the angle at the corner 9, of the detent, and, at the same time, it will drive the banking-piece 8, of the detent behind the pin *h*, and prevent it from returning;—the escapement-tooth will then pass along the face of the detent, which, being made like the detent in the former case, will thereby be depressed on that side, while the opposite side 9, is brought back into its original position, so as to lock the next tooth of the escapement-wheel. The impulse is given to the balance by the teeth on the opposite side of the escapement-wheel striking into the notch of, and forcing forward, the pallet *p*. In order to make the motion of the balance uniform, two small fans or flyers *k*, are placed on its arms, and, being made moveable thereon, they will admit of the speed of the time-keeper being regulated.

Fig. 6, represents, in front elevation, and fig. 7, in side or edge view, an escapement of somewhat similar construction to those already described, applied to a clock or time-piece furnished with a pendulum. The detent *c*, is constructed and acted upon in a similar manner to that shewn at figs. 1, and 2. *a*, is the pendulum, which is a compensating one, and will be hereafter more particularly described under the second head of the invention; *b*, is the escapement-wheel; *c*, the detent; *d*, the detent arm or lever, furnished, at its upper end, with a ruby pin; and *e*, is a spring or lever, attached to the back part of the pendulum, for the purpose of acting upon the detent arm *d*, precisely in the same manner as that shewn at fig. 1. The several parts, as represented at fig. 6, are in the position they would assume when the pendulum is in the act of returning, and has just unlocked the escapement-wheel, which is then about to move forward in the direction of the arrow. In doing this, it will, by means of one of its upper teeth acting against the pallet *p*, give an impulse to the pendulum in the direction in which it is going; and at the same time the tooth at the lower side, which has just been unlocked, will also advance, and, by striking against the raised side of the detent, will move the same back again, and cause the opposite side thereof to lock against the succeeding tooth of the escapement-wheel. By this arrangement, the pendulum is never resting on the escapement-wheel, and is only in contact with it when the escapement is unlocked from the detent; and one of the upper teeth of the escapement-wheel is allowed to act against the pallet *p*, to give the impulse, at the moment when the pendulum is going in the

same direction, as indicated by the arrows: a considerable amount of friction and wear is consequently avoided by this arrangement.

The improved method of compensating for the expansion and contraction of balance-springs, occasioned by changes of temperature, is exhibited under several modifications. Fig. 8, is a plan view of the simplest and most convenient arrangement for effecting this object. *a*, is the balance; and *s*, is the balance-spring, the inner end of which is, as usual, connected to the axis of the balance and its outer end to the curved arm of a T-shaped lever *l*;—the opposite end of which lever has another curved graduated arm *l**. The curve of this lever *l**, should be struck from the centre of the pivot of a metal arm *m*, which is secured to the upper plate of the watch or chronometer by a screw *n*, in such a manner that, when required, the arm may be moved to the right or left, after the screw *n*, is slightly loosened. The action of this compensating arrangement is as follows:—Supposing the balance-spring, by an increase of temperature, to elongate, the arm *m*, will also elongate, and, by acting against the inner side of the curved arm of the lever *l*, near its fulcrum, will force the graduated arm *l**, back, and thereby draw back the opposite end of the lever *l*, and thus take up a length of the balance-spring, proportionate to the amount that the latter has elongated. If, however, upon trial, it should be found that the bar *m*, by its expansion, causes the lever *l*, to take up too much of the balance-spring, then the screw *n*, must be loosened, and the arm *m*, moved further from the fulcrum of the lever *l*, a sufficient distance to correct the error. Of course if, on the other hand, the arm *m*, does not expand *sufficiently* to correct the error produced by the elongation of the balance-spring, then it must be moved *nearer* to the fulcrum of the lever *l*; but care must be taken, after every alteration in the position of the arm *m*, that it is properly and firmly secured to the plate by tightening the screw *n*.

Fig. 9, is a modification of the above,—the only variation being that the lever *l*, is somewhat different in form, and the arm *m*, is placed in a different position. It operates, however, in precisely the same manner, and will be perfectly understood, without any further description, by merely referring to the drawing.

Fig. 10, is another modification, in which, instead of the metal arm *m*, a glass tube containing mercury, and a small steel piston, are employed. The glass tube should be about half filled with mercury, and the steel piston then placed

therein. The tube is screwed down to the plate like the arm *m*, in the former instance, and it will be found to act in the same manner, except that mercury, being more sensitive to changes of temperature than other metals, will act more delicately. In employing mercury, it is necessary to prevent any portion of the mercury escaping from the tube; therefore, when the tube is detached from the watch or chronometer, for any necessary purpose, the steel piston should not be taken out of the tube; and, in order to prevent the piston from being accidentally removed, it is secured therein by means of the small screw *o*. The other small screw *j*, at the opposite end of the tube is merely to allow the air to escape therefrom when the mercury is poured in; and when the proper quantity of mercury is placed in the tube, and the steel piston is inserted, the hole at the inner end is closed by the screw *j*; and the screw *o*, which holds the steel piston, must be loosened to allow the piston to have full play.

Fig. 11, is a modification of the above plan; mercury being employed in conjunction with a steel piston. In this case the glass tube is curved, and the steel piston is made of a corresponding figure. The tube is screwed down at both ends to the upper plate, and the outer end of the balance-spring *s*, (it will be seen) is attached in some convenient and suitable manner to the outer end of the piston, so that as the mercury in the tube expands, it will force out the steel piston, and thereby draw back the balance-spring which is attached thereto. The balance *a*, is furnished, on two of its arms, with small fans or flyers *k*, for the purpose of regulating the velocity of the balance, as already described in reference to fig. 4.

At figs. 6, and 7, the improved compensating pendulum is shewn; fig. 6, being a front elevation and fig. 7, a longitudinal vertical section thereof. The pendulum is composed of two metal bars, one of brass and one of steel; and those parts of the two bars which effect the compensation are in the proportion of five of brass to three of steel. In the sectional view (fig. 7,) *q*, represents the brass bar, which is behind the steel one *r*. These two bars are connected together at their upper ends by a screw *t*,—a small plate or disc being placed between them. A small pulley *u*, is mounted at the lower end of the compensating part of the steel bar; and the remaining portion of the bar below this point does not affect the compensation, and only serves as a guide to the bob, which is suspended on the lower end of the steel bar by a chain *v*, connected at one end to the metal bob by a regulating-screw

w, whereby the mean time may be obtained after the two bars are properly adjusted for compensation. The chain *v,* after passing over the pulley *u,* and through a hole made in the brass bar *q,* descends to the lower end thereof, to which it is attached in any convenient manner. The upper end of the steel bar *r,* is furnished with a number of plain holes; and the brass bar *q,* has also a number of holes, which are tapped to receive the screw *t,* by which the two bars are connected together. These holes admit of the two bars being properly adjusted with exactness; the regulating-screw *w,* being merely employed to bring the clock to mean time when the compensating part of the pendulum is properly adjusted, as before stated.

Figs. 12, and 13, represent the improved method of adapting musical boxes to clocks, whether constructed according to the above described improvements or in the ordinary manner. By this arrangement the musical apparatus is made to play immediately before the hour is struck; and it will continue to play a certain length of time every hour, as long as the clock is wound up. Fig. 12, is a front view of the apparatus; and fig. 13, a side or edge view thereof. *a,* is a wheel, which forms part of the clock-movement, and makes exactly one revolution in an hour. The axle of this wheel carries an arm *b,* which, just before the termination of every hour, strikes against the lower end of a short arm *c,* of a double-armed lever *d,*—the longer arm of which carries a pin that works in a slot made in the end of another lever *e.* This lever *e,* has its fulcrum at *f*; and its upper end, when the musical apparatus is not working, is in contact with the flyer of the musical apparatus, which is prevented from working until this end of the lever *e,* is removed. The lever *e,* also carries a small pin or stud 1, which, when the apparatus is in a quiescent state, remains in a notch made in a groove at one end of the barrel *k,* of the musical apparatus.

The following is the mode of operation:—When the arm *b,* of the wheel *a,* strikes against and lifts up the short arm *c,* of the double lever *d,* the latter, by means of the pin at its opposite end, acts against the lower end of the lever *e,* and withdraws the upper end thereof from the flyer of the musical apparatus, which immediately begins to work; at the same time the pin or stud 1, has been partially lifted out of the notch of the groove at the end of the barrel *k,* of the musical apparatus; and, as this barrel begins to rotate by the action of the weight *l,* at its opposite end, the pin 1, will be forced further back into the annular part of the groove, where it

will remain all the while the barrel continues to rotate and the music to play. Immediately however that the notch comes round again, the pin drops in, and the upper end of the lever *e*, will rise and stop the flyer, and, consequently, the musical apparatus will cease playing. It is necessary however to prevent the striking apparatus from sounding the hours until the music has ceased playing; and this is effected by means of an arm *g*, projecting from the lever *d*, which arm prevents the pin of the ordinary warning-wheel *h*, from rotating, and consequently stops the striking apparatus until it is removed. It should be observed, that the lever *d*, carries a pin 2, which lifts up the ratchet-lever *i*, and permits the rack *j*, to fly back in the usual manner, leaving the striking apparatus ready to sound the hour immediately that the pin of the warning-wheel is freed from the arm *g*, of the lever *d*: this action takes place when the levers *d*, and *e*, are allowed to descend into their original position, by the pin 1, on the lever *e*, falling into the notch at the end of the musical barrel *k*. It will be evident, that the arm *b*, of the wheel *a*, will have passed by the end of the short lever *c*, and, consequently, will present no obstacle to the two levers *d*, and *e*, and the other parts, returning to their original position.

The patentees claim, First,—the arrangement or construction of escapements for watches, clocks, chronometers, or time-keepers, above described, with reference to the figures; and particularly placing the balance, the escapement-wheel, and detent, in a line; and also the peculiar manner of constructing and working the detent, or any mere modification thereof, whereby the same or a similar effect may be produced. Secondly,—the method of compensating the variations of balance or pendulum springs, by means of a metal rod or rods, or bars, which may be made to take up any increase or give out for any decrease, in the length of the spring, arising from variations in temperature, as above set forth; also the method, above described, of constructing compensating pendulums. Thirdly,—the method, above described, of adapting musical boxes or apparatus to clocks or time-keepers.—[*Inrolled November*, 1848.]

To James Sweetman Eiffe, *of* 48, *Lombard-street, City, for certain improvements in the manufacture of astronomical and other clocks, chronometers, and watches.*—[Sealed 8th December, 1847.]

This invention relates to improvements in the balance of

chronometers, watches, and other time-keepers; by which its compensating power is rendered more perfect.

In Plate XII., figs. 1, 2, 3, 4, 5, and 6, shew the improvements. Fig. 1, is a plan of the old ordinary balance, the compensating properties of which are in the rim or periphery *a*: it is composed of two metals, of unequal expanding powers, and has a plain passive steel bar for diameter-support, as shewn by figs. 2, and 3. The arms are made at an angle of inclination from a radial line, to assist the whole rim of compensating power; or they may be applied to a balance with a rim constructed of one substance only, and possessing no compensating properties in itself, as represented in fig. 3. The patentee remarks, that he does not confine himself to the construction of his compensating arms of the rectilineal shape or direction, as shewn in the drawings, as they may be constructed of curvilineal or of any other figure or direction of executive power or lateral abutment of compensating power seeking the same object. The rim *a*, of the balance, whether constructed of two metals, and having compensating power, or of one metal only, having no compensating power, is cut and divided in the usual manner; but the true position of the arms is preserved by thin plates *e*, *e*, so made as to allow of a compensating motion, but no more. *f*, *f*, are the weights, as above mentioned. Figs. 4, and 5, represent arms *d*, *d*, describing the chord and segmental plan: their action is geometrical, and of similar purpose to the oblique arms before named. d^1, d^1, shew the before-named diameter-bar in ordinary. The arms *d*, *d*, carry weights *f*, and f^1; and upon the upper surface of the large weights are the adjusting plates *h*, *h*, moveable upon screws attached to these weights. Fig. 6, represents a balance, constructed with compensating radial arms, acting either as auxiliaries to the usual compensating rim or periphery or as the sole compensating power. This balance is made in the following manner:—*d*, *d*, are radial arms, which carry the rim or periphery *a*, *a*, cut in the usual manner, and provided with ordinary weights *b*, *b*. Through the arms *d*, *d*, mortices or slots are cut; and pieces of brass d^1, d^1, are let therein, so as not entirely to fill the mortices: they are attached to the arms by the ordinary melting process. The portions of the steel arms, to which they are not attached, are cut transversely through about the middle of their length; and pins or screws, covered by protecting-caps a^1, a^1, are inserted within the cuts, for the purpose of resisting force, as also for steadying and supporting the whole plan.

The second part of the invention refers to that portion of

astronomical clocks and other time-keepers called the pendulum; and consists in an improvement on that construction of pendulum known as Graham's mercurial pendulum. Fig. 7, represents this pendulum, with the improvement applied thereto. It is well known that, in Graham's pendulum, a receptacle of a perfectly cylindrical form is made, to contain mercury. In it the changes of position of the mercury, which is the compensating medium, is of uniform progress; but the equal rising and falling of the mercury prevents the obtainment of that most desirable object—a uniformity of going in all temperatures. To arrive at this, and to render the vibrations of the mercurial pendulum more regular, the present patentee makes the receptacle of a conical or varying form, whereby a difference of motion in the body of mercury is effected. The patentee states that all clocks, equally adjusted in the extremes of temperature, gain in middle temperatures, like the old balance of marine chronometers; but the employment of the cone or varying receptacle will overcome the difficulty. The error, he says, may not seem to exist in some clocks; but to conclude that such was really the case would be erroneous. He does not confine himself to any angle or curve for the sectional figure of the mercury vessel.

Figs. 8, and 9, represent an apparatus for ordinary clocks. This arrangement is stated to be very useful for observations, as it will call the attention and ensure the hearing; it will not disturb the ordinary time-measuring mechanism; and in it great confidence can be placed. The anchor-angles of the pallets have annexed at *a, a,* strips or levers of metal *b, b,* which operate as follows:—Upon the ends of the levers *c, c,* fixed upon the axes *d, d,* (which have motion on their pivots in the brass frame plates *e, e,*) are attached arms of steel c^1, c^1, coming in contact with the pieces *b, b,* upon the anchor-angles. These pieces c^1, c^1, are so attached that, during the outward movement of the anchor-angles, the pieces *b, b,* attached thereon, will pass without disturbing the hammers on that side, by reason of very delicate springs, called passing springs: the hammers are seen at c^2, c^2. By this invention loud beats are produced simultaneously with the faint beat given by the teeth of the ordinary escape-wheel on the pallets. On withdrawing the vertical bolt, on the top of the case, the apparatus becomes instantly detached without any friction or disturbing result. Fig. 10, shews how the levers *b, b,* may be fixed upon the axis of the pallet;—the action is here the same; and friction-rollers can be used to this form easily. The silk threads *l, l,* attached to the levers *c, c,* are preferred:

the spring *h*, is pressed downwards by the bolt or finger-piece *m*.

Figs. 11, and 12, shew a "remontoir spring." By this means, any evil proceeding from the necessary shake in wheels and pinions is counteracted. This mode is considered by the patentee as highly useful in his mode of constructing astronomical clocks, because he has overcome the difficulty of driving two pinions by the barrel great wheel, almost simultaneously, and producing centre seconds,—an old desideratum. The remontoir keeps the bearing of the driven leaf always with the action-side in contact; and the motion from the barrel always keeps the spring wound up. Fig. 11, shews the dial-face of the clock in section. *a*, is the minute or other hand, which requires help in this case; *b*, is the dial-face; *c*, the axis; *d*, is a circular plate, through which the axis *c*, passes; *e, e, e*, are three studs, projecting from the face of the plate *d*; and against these studs the brass disc *f*, is forced by the helical spring *g*, which it securely holds by a small stud on its back. The spring is secured by another stud *h*, behind, firmly fixed on the axis *c*. By the free motion of the disc on the axis, and the resisting power of the three studs on the main plate, the "re-motion" is, as before referred to, produced.

Fig. 13, shews a compensating apparatus applied to the upper part of the pendulum of a common clock. The steel spring *b*, passes through the bracket *c*, with gentle pressure: the upper part of the pendulum-spring is attached to the compensating-lever *d*, which can be adjusted by lengthening or shortening the screw *e*, in the usual way.

The patentee claims "all those said and herein-described figures, together with, and lastly, a method of burnishing the periphery of balances by a cylindrical weight, affixed and supported to its burnishing pressure by a strong wooden frame, numerically applied, to ensure uniformity and truth, when the balance may be intersected, for its compensating use."—[*Inrolled December*, 1847.]

To William Brown Rooff, *of Stanhope-street, Regent's Park, in the county of Middlesex, chemist, for certain improvements in the construction of respirators.*—[Sealed 21st September, 1848.]

This invention of improvements in the construction of respirators has for its object the supply of pure warm air to the

lungs of consumptive and asthmatic patients, or other persons requiring the same. This is effected by providing separate and distinct channels for the passage of the pure and expired air to and from the mouth of the patient;—such channels being furnished with valves, which will effectually prevent the expired and inspired air from mixing, and the expired air from being again, in part, taken into the lungs, as is the case when the respirators, now generally in use, are worn. By this improved construction of respirator the heat of the expired air is made to warm the pure air as it passes through the instrument to the mouth of the patient, and thus the pure atmospheric air, received by the respiratory organs of the patient, is raised to such a temperature as will remove all cause of irritation thereto.

In Plate XII., the improved construction of respirator is shewn in several views; the silk band or other covering, by which it is attached to the patient, being removed, the better to shew the instrument. Fig. 1, is a front view of the respirator, which is made of a crescent shape in plan, in order to fit closely over the mouth; fig. 2, is a view of the side which fits against the mouth; and fig. 3, is a vertical section, taken through the middle of the respirator. The instrument consists of a crescent or other suitably-shaped metal case *a*; the front of which is pierced with holes *b*, *b*, (see fig. 1,) for the admission of pure air. The back of this case (see figs. 2, and 3,) is provided with a valve-box *c*, through which the air from the atmosphere passes to the mouth to be inspired. The cover of this valve-box is perforated as shewn; and the valve is made so as to open outwards towards the mouth of the patient. Within the case *a*, are two horizontal partitions *d*, *d**, shewn best at fig. 4, which is a sectional elevation of the respirator,—the front of the case *a*, being removed. These partitions *d*, *d**, are intended to receive the ends of a series of vertical metal tubes *e*, *e*, which are set at equal distances apart, as shewn in the horizontal sectional view at fig. 5, (taken in the line 1, 2, of fig. 2,) and fill up the space between the partitions *d*, *d**, so as to allow of but narrow channels for the passage of the pure air between and around them, as it passes from the entrance openings *b*, to the valve-box *c*, to be breathed by the patient. In the inner face of the case *a*, between the top thereof and the partition *d*, a series of openings *f*, are made (see fig. 4,), for the purpose of allowing the vitiated or expired air to pass off to the atmosphere. This vitiated air, on entering the chamber, formed by the top of the case *a*, and the horizontal partition *d*, passes down the

tubes *e*, and enters another chamber, formed by the partition *d**, and a third partition *g*. In this partition *g*, are openings, which are covered by valves, as shewn at fig. 6, which is a sectional view, looking upwards, taken in the line 3, 4, of fig. 4. The expired air passes out at these valves, and through the grating, which forms the bottom of the case *a*, into the atmosphere; and, while thus passing out, the conducting tubes *e, e*, are, at the same time, heated. As the patient commences a fresh inflation of his lungs, pure air is drawn into the respirator through the openings *b*, and, coming in contact with the heated tubes *e, e*, in its passage to the valve-box *c*, its temperature is raised to a degree suitable for inhalation. Thus, at every expiration, the vitiated air is carried off by a channel distinct from that which conducts the pure air to the mouth; and, at every inspiration, a supply of air, uncontaminated with the vitiated air from the lungs, is drawn into the instrument and warmed, before it reaches the lips of the patient. To prevent air from reaching the mouth of the patient otherwise than through the proper channels, a padding *h, h*, (figs. 2, and 3,) is provided, which fits close around the mouth, and thus effectually prevents the access of air otherwise than through the instrument in the way desired.

The patentee remarks that bandages, resembling neckcloths, may be attached to the instruments, as usual with respirators; but care should be taken that the front of the respirator is not so thickly covered with such bandage as to impede the ready passage of the air through the openings *b*. The metal he prefers to use in making these instruments is silver, as it is not readily affected by the moisture of the breath; but other metals or alloys of metals, plated with silver, may also be employed with advantage.

The patentee claims constructing respirators in such a manner that the vitiated or expired air may be conducted off in a separate channel from the in-coming air to be inspired, and thus, through the medium of its metallic channel, be made to heat the pure air on its passage to the respiratory organs of the patient, as above described.—[*Inrolled March*, 1849.]

To Robert Thomson Pattison, *of the City of Glasgow, in Scotland, printer, for an improved preparation or material for fixing paint or pigment colors on cotton, linen, woollen, silk, and other woven fabrics.*—[Sealed 2nd November, 1848.]

The improved preparation or material for fixing colors on

woven fabrics, which constitutes this invention, is made or extracted from milk.

The manner of producing the fixing material varies slightly, according to the state in which the milk is when used for that purpose. For example, it is made from butter-milk in the following manner:—The butter-milk, as soon as possible after churning, is put into a boiler and heated to 160° Fahr., which causes the curd to precipitate from the whey; the contents of the boiler are then strained through a cloth, to separate the curd from the whey; after which, the curd is subjected to pressure, by being placed in a cheese-press for a night; it is next broken and granulated, by being rubbed through a wire sieve; it is then spread upon cloth sieves, arranged on shelves in a room in connection with a stove, by which it will be gradually dried; and, when dry, it is ground to fine powder: it is now in a fit state to be used for fixing colors on fabrics. Although the patentee prefers to make the fixing material from butter-milk, yet it may be made from new milk or from skimmed milk. In either case it is necessary, after the milk has been heated to 160° Fahr., to add to the contents of the boiler a quantity of acid sufficient to effect the precipitation of the curd: most acids will answer; but oxalic acid is recommended to be used. When the curd has been precipitated, it is treated in the same manner as that obtained from butter-milk. The fixing material is termed by the patentee "lactarine."

The relative quantities of the lactarine and the colors to be applied to the fabrics will vary according to the result desired to be obtained with regard to the color or shade. As an example, the following mode of fixing a medium shade of ultramarine blue is given:—Two gallons of water and three pounds of lactarine are mixed in a suitable vessel, and then four gills of *ammonia fort* are added, which will have the effect of dissolving the lactarine and converting the mixture into a thick gum or gummy substance. In another vessel one gallon of water and twelve pounds of ultramarine blue are mixed together, and the contents of the two vessels are thoroughly mixed; the combined mixture is then strained through a fine cloth; after which it is ready for printing. The operations of printing, straining, and finishing the fabrics, are successively performed in the manner usually adopted by calico printers.

The patentee, in his concluding remarks, says, "what I claim, as my invention or discovery, is, the making or extracting from milk the particular preparation or material above described, and which I have called lactarine, possessing the

peculiar power or inherent quality of fixing paint or pigment colors to woven fabrics, and capable of being easily, effectively, and beneficially applied for that purpose;" but he does not confine himself to the above methods of preparing and applying the said fixing material.—[*Inrolled March*, 1849.]

To David Newton, *of Macclesfield, in the county of Chester, merchant, for his invention of certain improvements in the application of glass or glazed surfaces to nautical, architectural, and other similar purposes.*—[Sealed 7th August, 1848.]

The first part of this invention consists in the application, adaptation, employment, or use, of glass terminals, of a globular or other form, to the mast-heads of vessels,—the object being, to protect the same from the action of the electric fluid, more especially in tropical climes,—the glass terminal acting as a non-conductor or lightning repellant, and also as a telescopic object of sight on the horizon. For the further carrying out of the principle of electric non-interference or non-attraction, the patentee also applies to the terminals, or each end of the yard-arms (or other extremities) of ships or vessels, caps or ends of glass or glazed surfaces.

In Plate XI., fig. 1, represents the mast-head of a vessel, capped or protected by a glass terminal *a*, which may be colorless, or wholly or in part colored. The terminal is hollow, having an aperture or orifice *b*, communicating with the interior, for the purpose of preserving the atmospheric equilibrium. Another application of the first part of this invention consists in the adaptation of glass weather-vanes and finials, of whatever design, (whether colored, stained, or not, compressed, cut, or otherwise formed) to spires and pinnacles of churches, and other prominent parts of the exterior of buildings,—for the purpose of presenting a non-conductor to the electric fluid, and also adding to the economy, durability, and beauty of effect, in any situation in which glass may be employed, combined with usefulness and ornamentation. Fig. 2, represents a glass weather-vane. *a, a*, is the vane, turning upon a pin or wire *b*, as usual; *c*, is a cone of glass, placed over the vane, for the purpose of preventing rain or water from getting into the joint, and obstructing the action of the vane. It will be evident that, in this and similar applications, no painting or gilding is required.

The second part of the invention consists in the application

and adaptation of compressed, cut, or other colored or colorless glass, to the purposes of external and internal decorations of buildings and erections, in all cases where it can be usefully and economically substituted for carved stone, marble, wood, or plastic compositions; so as to effect a considerable economy by obviating the necessity of painting and gilding, and, at the same time, combine durability with cheapness of workmanship. Among the principal applications of this part of the invention may be enumerated the following:—Crocket mouldings (see figs. 3, and 4,), mullions, and tracery of windows, altars or chancels, tablets or monumental escutcheons, finials for church seats or benches, &c. (see fig. 5,) capitals of columns, or the enrichments thereof when made of other materials than glass balustrades, and arabesques (see fig. 6,); also brackets, trusses, corbels, shields, armorial bearings or parts thereof, and the enrichments of cornices, pilasters, or pillars, by glass pateras, or stud-rosettes, ball-flower, cusp, or foil, &c.; also pendants (see fig. 7, which represents a pendant of the stalactite form), and bosses (see fig. 8,); also the ornamental part of the ridge of roofs, of whatever design, either fastened by studs (see fig. 9,) or in grooves (see figs. 10, and 11,) cast or compressed in convenient lengths.

The third part of the invention consists in the adaptation and use of colored or colorless glass keys for what are commonly called the accidental notes (and usually made of ebony) in piano-fortes, seraphines, organs, and other like musical instruments, and in the use or employment of glass legs or supports for such instruments, in order to isolate the same, and consequently improve their tone. These keys, made of cut or compressed glass, may be dove-tailed internally or externally at the back, as preferred (being of the usual form above), and may be plated with silver underneath, or backed with other bright metallic surface, as foil, &c., either colored or not.

The fourth part of the invention consists in the application and adaptation of cut or compressed glass, either colored or otherwise, to the manufacture of letters and numerals, of whatever character or form, to be used for designating buildings, streets, trades, professions, &c., and on the dials of clocks. Fig. 12, represents a raised letter of prismatic form, and figs. 13, and 14, represent, in front and sectional views, an inverted or counter-sunk prismatic letter, which is intended to be let in or sunk into the front or side of buildings or signs, grooved or cut out for their reception. These letters or numerals may also be let into wood, stone, metal, porce-

lain, earthenware, or set in gutta-percha or other plastic material; or they may be set so as to be transparent, or may be silver-plated behind, or be backed with foil or other bright metallic surface.

The fifth part of the invention consists in the application and adaptation of glass, either hollow or solid, colored or otherwise, to the manufacture of enigmatical signs or emblems of trades, professions, or callings, in place of the expensive carved wood signs or emblems usually employed for such purposes: these emblematical signs may either be made wholly of glass, or may be of other material, coated or covered with glass, and will be found much more durable, and also economical, as neither painting nor gilding will be required. —[*Inrolled February,* 1849.]

To Edward Gribben Wilson, *of Bury, in the county of Lancaster, tin-plate worker, for his invention of certain improvements in the construction of tin drums or rollers used in the machinery for drawing, spinning, doubling, twisting, and throwing cotton, wool, silk, flax, and other fibrous substances.*—[Sealed 1st August, 1848.]

These improvements in the construction of tin drums or rollers, used in the machinery for drawing, spinning, doubling, twisting, and throwing cotton, wool, silk, flax, and other fibrous substances, apply to the construction of the drums or rollers usually employed in such machinery for the purpose of driving the spindles; and their principal object is to impart to such drums or rollers a greater degree of strength and durability, and also a much more accurate and true surface than can be obtained by the ordinary method of manufacture. It is well known to persons conversant with such machinery that tin drums and rollers, manufactured in the manner hitherto employed, are, on account of the number of joints and piecings, very liable to get distorted and to break at the joints; and also that, for the same reason, there are always more or less irregularities and inequalities of surface; and that the driving-bands, by sometimes working in the crevice at the junction of the different lengths of which the roller is formed, and sometimes upon the top of the swaging (which is often slightly raised above the level of the rest of the length, and consequently of a larger diameter), cause an uncertainty and irregularity in the speed of the spindles exceedingly detrimental to the perfect and uniform operation of the machine.

In manufacturing a tin throstle roller, by the ordinary process, as hitherto employed (supposing the roller to be about twelve feet in length and nine inches diameter), it is constructed in twelve lengths, jointed together; each length being composed of three sheets of tin, so that each roller requires thirty-six sheets of tin to form the body, exclusive of the ends and blocks. The present invention consists simply in constructing the said rollers of tin plates of a much larger size than have hitherto been employed for that purpose, say from three feet to twelve feet, or more, in length, and sufficiently wide to form the circumference; so that a tin roller, of twelve feet long, can be composed of four sheets, three sheets, two sheets, or one sheet of tin, and have only three joints, two joints, or no joint in the whole length, instead of eleven, as by the ordinary method; each length having thus but one seam instead of three. When the roller has been thus made, and the joints and seams well secured, the roller must be rounded and turned in a slide or other lathe (upon a mandril adapted to its length and diameter) to a perfect and uniform cylinder, presenting a straight and parallel surface. Thus it will be evident that the liability of such rollers to get distorted and break at the joints, and their want of uniformity of diameter and truth of surface—inevitable under the old mode of construction—is completely obviated by the improved method, and a more perfect uniformity than has hitherto been obtained in the speed of the spindles is ensured.

In manufacturing tin drums for self-acting and other mules, the improvement consists in constructing the grooved pulley, which receives the driving-band, of one and the same piece with the rim of the body, instead of being made of a separate piece, and soldered together in the usual way. By the use of this improvement, it will be seen that the drum is much less liable to get out of repair; and if the pulley should wear out, it may be replaced with great facility,—the drum being provided with an internal belt to support its circumference, should the original pulley be removed.

The patentee claims, Firstly,—the method of constructing tin rollers, used in the above-named machinery, of tin plates of a much larger size than have hitherto been employed for that purpose, so as to require much fewer seams and joints; and also rounding and turning them in a slide or other lathe, as above described. Secondly,—in forming the grooved pulley of mule-drums of one and the same piece with the rim of the

body of the drum itself, instead of forming it of separate pieces and soldering it on to the drum, as hitherto practised. —[*Inrolled February*, 1849.]

To WILLIAM WOOD, *of* 23, *Cranmer-place, Waterloo-road, in the county of Surrey, carpet manufacturer, for improvements in weaving carpets, and in printing carpets and other fabrics.*—[Sealed 30th May, 1848.]

THE improvements in weaving carpets, which constitute the first part of this invention, consist in a mode of adding substance, or thickness, or, as it is technically termed, the "dead," to Brussels carpets, or carpets made with hollow-looped surfaces, and also cut-pile carpets.

When the pattern is printed or dyed on the warp, and when the carpet is woven of one color or plain, in order to be printed after weaving, then only so much worsted is used as is sufficient to form the loops on the face of the fabric; and, in these cases, it is the practice of those manufacturers who make printed carpets, to introduce additional linen threads or dead warp as substitutes for the worsted omitted; but, as the linen thread commonly used is a smooth dense body, it does not fill up so well, nor give that bulk and elasticity which worsted or woollen does, and the carpet thereby loses some of its best qualities, viz., thickness, warmth, and elasticity: the ordinary kind of weft used in weaving such carpets has been that which binds down the worsted, and which is the same both on the face and back. Now, the mode of operating, according to this invention, consists in giving the requisite substance and elasticity to such carpets by the use of additional weft at the back or in the body, much thicker than that on the face.

The mode of carrying this part of the invention into practice, with an ordinary Brussels carpet-loom, is as follows:— After putting in the wire, or otherwise forming the loop, the patentee throws in the usual linen shoot on the face, to bind it; and then, for the back shoot, he throws in a thick soft weft. Or, to make a better edge and more elastic back, he employs the ordinary two linen shoots—one on the face and the other in the back—and then (or before throwing in the second linen shoot) he draws down only one-half of the lower portion of the linen warp (being one-quarter of the whole), and throws in the thick shoot, which is driven up by the

batten or lay, so as to cover the second linen shoot, which is then inside the fabric: from the thick shoot being only bound by every alternate yarn of the warp, it will be more elastic than if bound more closely, by using every yarn; whilst the second linen shoot (having half the warp over it) holds down the face or first shoot; and any inequality in the taking up of the linen warp, by one portion of it binding in a greater substance than the other, is remedied by drawing down the different portions in succession.

The improvements in printing, which constitute the second part of this invention, and are chiefly applicable to printing carpets and other fabrics, having hollow-looped or cut-pile surfaces, consist in a new mode of using cylinders or rollers for laying on colors; by which the colors may be correctly repeated on the required parts of the same surface of the fabrics.

By the present mode of working cylinder or roller printing-machines, Brussels and other pile carpets, and many other thick fabrics, cannot be impressed sufficiently with colored patterns; as, after the fabric is passed through the machine, it is found to be only partially printed; consequently, the otherwise manifold advantages of cylinder printing have not been made available for such fabrics. The object of this part of the present invention is to remove the difficulty; for, although one impression of a cylinder upon a looped or cut-pile carpet, or on many other fabrics, is insufficient, yet, if the impression be repeated several times, varying in number with the thickness or nature of the fabric, any quantity of color can be given.

The mode of carrying out the improvements in printing is as follows:—The patentee first provides a suitable printing-table, which he prefers to be long enough to receive the entire length or piece of carpet to be printed; at each end of the table there is a frame of the same height or level, sufficiently long to receive the cylinder printing-machine when off the fabric; and on the surface of the table the printing-blanket is laid, between two rails or guides, which are fixed at exactly the same distance apart as the carpet or cloth is wide, so as to keep the cloth in one position, and to form the guides for the printing-cylinders. The carpet or cloth is fastened to one end of the table, and is then laid on the top of the same, and drawn tight at the other end by a roller, which is furnished with a ratchet-wheel and click. The printing-cylinders are mounted in a moveable frame, containing a corresponding number of color-cans and feeding-rollers, to supply them with

color; this printing apparatus is passed over the table and between the guide-rails (the patterns on the cylinders being colored and bearing upon the carpet or cloth) to the frame at the other end of the table, and then back again; and this process is repeated until the fabric is sufficiently colored. In order to ensure each part of the pattern or printing-surface coming again and again on the same place, the patentee affixes toothed wheels on the axis of the printing-cylinders, which gear into racks fixed on the sides of the table; so that, however frequently the printing apparatus passes over the fabric, every part of the pattern will fall on the same place. Instead of the printing apparatus being passed back again over the same table, it may, by the application of moveable frames at the ends of the table, be moved sideways, so as to pass over a carpet, or other fabric, upon a table at the side of the first: this plan might be carried out by using any number of tables.

The patentee claims, Firstly,—the mode of manufacturing carpets made with hollow-looped or cut-pile surfaces, and woven with printed warp, or woven with one colored warp, or plain, to be afterwards printed, by adding thick weft, as above described. Secondly,—the mode of printing piled and other fabrics, by employing cylinders or rollers, so actuated and controlled as to ensure the colors being repeated on the same parts of the fabric.—[*Inrolled November*, 1848.]

To Joseph Gillott *and* John Morrison, *of Birmingham, for improvements in ornamenting cylindrical and other surfaces of wood and other materials.*—[Sealed 28th September, 1848.]

The patentees commence their specification by stating, that it has been the practice to ornament cylinders of wood (such as are employed for pen-holders, pencils, and other purposes) and the surfaces of tubes, by passing the same through dies or plates, so formed as to produce lines on such cylindrical surfaces, parallel with the central axis of the articles;—the dies or plates being stationary, and the articles to be ornamented being forced through the same. Now, this invention consists in embossing cylindrical or other forms of wood and other materials by passing the same through dies or plates (having suitable apertures, formed with oblique or straight grooves), which are caused to rotate, or partially rotate, while the article, at the same time, is held firmly, and prevented

from rotating, or is allowed to rotate. By this means the article will be embossed with waved parallel lines, or with lines passing helically round it, or with two series of helical lines crossing each other.

In Plate XII., fig. 1, is a plan view of the apparatus employed by the patentees; fig. 2, is a longitudinal section of the same; and fig. 3, is a transverse section, taken just behind the die-holder. *a*, is the bed-plate, formed with dovetail grooves, to receive corresponding projections on the under side of the plate *b*; on the top of which plate a rack *c*, is fixed. This rack *c*, gears into a toothed wheel *d*, which can be turned by means of the handle *e*, and so cause the plate *b*, to slide in either direction; and, at the front of the plate *b*, there is a socket, to receive the stem of the "forcer" *f*, by which the piece of wood to be ornamented (shewn by dotted lines in figs. 1, and 2,) is pressed towards the holder *g*, containing the die: the wheel *d*, is prevented from making an entire rotation, in either direction, by the stop *h*, affixed on its axis; and, consequently, the motion of the plate *b*, is limited to a corresponding extent. The die-holder *g*, which is circular, is mounted in a suitable bearing, wherein it can turn freely; and the top of the die-holder is formed with a short arm, which is connected with the horizontal rod *i*, by means of a pin, that passes through vertical slots in the arm and rod. The rod *i*, works through holes in the brackets *j*, *j*, and is connected at one end, by a pin-joint, with the lever *k*; this lever turns on a centre at *l*, and is furnished with two adjustable pins or studs *m*, *m*, which bear against the edge of the templet *n*, affixed to the plate *b*; so that as the plate *b*, advances, the indented edge of the templet will, by acting against the studs *m*, *m*, impart a vibrating motion to the lever *k*; the rod *i*, will thus be made to slide to and fro in the brackets *j*, *j*, and cause the die-holder to perform a small portion of a revolution, in either direction, alternately; and, as the pencil or cylinder to be ornamented is, at the same time, being urged onwards by the forcer *f*, the die, which is formed with straight grooves, will produce a series of waved parallel lines over the whole surface of the article. Figs. 4, represent an end view and a vertical section of the die, on an enlarged scale.

If it should be desired to ornament the article with lines, winding helically around the same, the die shewn at figs. 5, is used; which die is formed with oblique lines, and can turn freely in its holder; and the end of the forcer is made with a conical recess, so as to permit the article to rotate, in the

event of the die sticking fast; whereas, the forcer used with the die represented at figs. 4, is formed with a rough end, in order to prevent the article from rotating. Two series of helical lines, crossing each other, may be produced by using two dies in combination, formed with oblique grooves, in opposite directions, as represented in the sectional view fig. 6.

The articles to be ornamented, instead of being forced through the die, may be drawn through the same; and the drawing is particularly recommended when tubes are to be embossed. Although only cylindrical articles are mentioned in the above description, the invention is also applicable to articles which, more or less, approach the cylindrical form.

The patentees claim the embossing of cylindrical or other forms of wood and other materials, by passing the same through dies or plates with oblique or straight grooves, which rotate or partially rotate, and by causing the article ornamented to be held, or to rotate on its axis, in such manner that the embossing lines shall be in helical or partially in helical directions.—[*Inrolled March*, 1849.]

To Daniel Watney, *of Wandsworth, in the county of Surrey, distiller, and* John James Wentworth, *of Wandsworth, engineer, for improvements in machinery for drilling metals and other substances.*—[Sealed 12th October, 1848.]

These improvements in machinery for drilling metals and other substances are represented in Plate XI. Fig. 1, is an elevation of the apparatus; fig. 2, is a section, taken on the line A, B, of fig. 1; and figs. 3, and 4, shew some of the parts detached. *a*, is a frame, resting upon a base or foot *b*, from which a pin projects upwards through a hole in the lower part of the frame, and a nut *c*, is screwed thereon, whereby the frame is securely attached to the base or foot, and yet it may be readily turned into any desired position. At the top of the frame a nut *d*, is formed, to receive the screw *e*, that carries the disc or plate *f*, which can turn freely on the upper part of the stem of the screw; and by this arrangement the frame *a*, may be securely retained between two fixed parallel surfaces, such as between the floor and roof or ceiling of a room or of a mine. *g*, is a block (shewn separately at figs. 3,) that slides up and down in the frame *a*; and *h*, is a clamping-plate (represented detached at figs. 4,) by which the block *g*, is retained at any desired elevation;—

the parts *g*, *h*, being combined by a screw-bolt *i*, with a conical stem, and a nut *j*: by this arrangement the screw-socket or head i^1, of the screw *i*, may be fixed in any desired position, and so that the screw *k*, which is inserted into the socket i^1, will be held in a horizontal position, or at an angle to a horizontal line; and as the frame *a*, can move on its axis, and be readily taken down and moved, and again secured between two fixed parallel surfaces (whether such surfaces be horizontal, or vertical, or otherwise), it is evident that this drill-machinery may be used under very varying circumstances. The end of the drill enters a recess in the end of the screw *i*, and turns therein as a bearing; and motion is given to the drill in the ordinary manner.

From the preceding description it will be evident that the drill may be made to act in any direction; it may therefore be employed in cases where the matters to be drilled are fixed, or cannot be conveniently moved to the drill; and owing to the screw *i*, being readily set and held in any direction in respect to the frame *a*, the action of the drill may be in a horizontal or angular direction: thus, supposing the frame *a*, to be fixed between the floor and roof of a mine, or tunnel, or other works, where rock is to be blasted, and it be desired to drill holes for such purpose, it will be evident that such holes may be made in any desired direction, owing to the capability of universal movement of the parts that govern the direction in which the drill shall work.

The patentees state, that although they prefer to employ an open frame *a*, as shewn, yet this construction or arrangement may be varied; and although it has been stated above that the end of the drill enters a recess in the end of the screw *i*, yet this mode of holding the drill may be varied. They claim the mode, above described, of combining parts into a machine for drilling metals and other substances.—[*Inrolled April*, 1849.]

To THOMAS METCALFE, *of High-street, Camden-town, in the county of Middlesex, Gent., for improvements in the construction of chairs, sofas, and other articles of furniture for sitting and reclining on.*—[Sealed 5th October, 1848.]

THE improvements in the construction of chairs, sofas, and other articles of furniture for sitting and reclining on, which constitute this invention, are represented in Plate XII. Fig. 1, is a vertical section of a chair; fig. 2, is a front view

thereof; and fig. 3, is a section of the same in a folded state. Fig. 4, is an end view and fig. 5, a front view of a sofa. Fig. 6, is a vertical section of a camp bed: in this case there is an additional frame *e*, which forms, at other times, a foot-rest; and, in order to afford support to the head, uprights *f*, are used; and there are others *g*, for the feet. Each of these articles of furniture is composed of the two frames *a*, *b*, (made, by preference, of metal) combined in such manner that the small one *a*, acts as a support, from which the front end of the piece of canvas or other suitable fabric or material *c*, that forms the seat, is suspended, whilst the large frame *b*, serves to form the back, and to the upper rail thereof the other end of the piece *c*, is attached. The frames *a*, *b*, are combined by axes *d*, or other suitable means, so that they may be folded together when not in use (as shewn at fig. 3,) or adjusted to any desired inclination when in use; and the bottom rails of the frames *a*, *b*, are connected by straps *h*, by which the frames are prevented from becoming too much inclined.

It will be evident that "forms," or such like articles of furniture, with narrower seats than those of sofas, may be constructed after the above manner. The peculiarity of this invention consists in there being frames *a*, *b*, of different sizes or heights combined by a flexible connection, which forms the seat and the back, and generally the surface for sitting or reclining on; the one frame *b*, being high enough to form the back when combined with the part *c*, whilst the smaller frame is of the proper height for suspending the seating; and the desired inclination of the two frames being determined by straps.

The patentee claims, as his invention, the manner of combining parts *a*, *b*, *c*, into chairs, sofas, and other articles of furniture for sitting or reclining on.—[*Inrolled April*, 1849.]

To Robert Angus Smith, *of Manchester, for improvements in the application and preparation of coal tar.*—[Sealed 19th October, 1848.]

This invention consists in coating the interior of water pipes with coal tar, prepared for that purpose.

The coal tar is reduced by distillation, or otherwise, to a thick pitch-like mass, which is kept melted at a temperature of 300° Fahr. (or such temperature as will keep the matter in a fluid state), in a suitable open vessel, of a size and depth

depending on the pipes to be operated upon. The interior surface of the water-pipes is first cleaned, so as to remove any oxide; and then the patentee prefers to coat the clean surface with linseed oil, particularly when the pipes cannot be immediately coated with the coal tar. The pipes are heated to about 300° Fahr. in a stove; then they are immersed in the melted coal tar, in which they are allowed to remain for about an hour; and at the expiration of this time the coal tar will generally be found to have attached itself closely to the surfaces of the pipes, both inside and out: the chief object, however, is to obtain a good coating on the inside. The patentee states that, in removing the pipes from the melted coal tar, he has found it desirable to pour a quantity of linseed oil on the coated surfaces, which he finds to have the effect of removing any excess of the coal tar; and the oil, running into the coal tar, keeps it fluid, and prevents it from becoming unsuitable for the operation of coating the pipes. Instead of heating the pipes before immersion, a like effect may be produced by immersing the pipes in the melted coal tar after the interior surface has been cleaned, and allowing them to remain therein for some time after they have become as hot as the coal tar: this process will generally occupy about one hour and a half.

The patentee does not confine himself to the precise details above given; but he claims the coating the interior of water-pipes with coal tar by the aid of heat.—[*Inrolled April*, 1849.]

To SIDNEY EDWARDS MORSE, *of Ampton-place, Gray's Inn-road, for improvements in the manufacture of plates or surfaces for printing or embossing.*—[Sealed 13th January, 1848.]

THE first part of this invention consists in making plates or surfaces for printing or embossing by a new mode of combining two substances, one of which is afterwards partially destroyed or removed.

The mode of carrying out this part of the invention is as follows:—The patentee takes a copper plate, a little wider and several inches longer than the subject to be printed or embossed, and upon all the lower part thereof, both back and front, he spreads an etching ground; through the etching ground at the front of the plate, by means of an etching needle or other suitable tool, he writes, draws, or forms the letters, map, picture, or other subject which it may be de-

sired to print or emboss, not in reverse, as in ordinary copper-plate etching, but as when writing or drawing upon paper; and when the writing or drawing is finished, he immerses that part of the plate which contains it, for a moment, in a weak solution of per-nitrate of mercury, formed by adding one part of the saturated solution to fifty or sixty parts of water: the lines and marks on the copper will thus be covered with a thin film of mercury, which will prevent the too strong adhesion of the copper subsequently deposited on them. The plate is well rinsed, after taking it from the mercurial solution, by pouring clean water over the face; and then that part of the plate which contains the writing or drawing is immersed in a solution of sulphate of copper, and connected with a galvanic battery, in order that copper may be deposited in all the lines and marks. For some time the deposit of copper will be confined to the lines and places from which the etching ground has been removed; but at length the copper will be deposited in other places; and then, or before this takes place (if the copper lines should be getting too broad for producing the desired effect in the contemplated printing or embossing), the plate is to be rinsed with clean water—the lower part, embracing all the deposited copper, is to be immersed, for a moment, in the solution of per-nitrate of mercury—the plate is to be again rinsed—and finally it is to be dried.

The patentee now takes a piece of pasteboard, of the same length and breadth as the copper plate, and corresponding in thickness with the intended printing or embossing plate; he cuts out the central portion thereof, leaving merely a rim (narrow at the sides and bottom, but broader at the top), which will just encircle the writing or drawing on the copper plate, and form a cavity of the precise dimensions of the desired printing or embossing plate; through the middle of the upper side of the rim he cuts a narrow channel, through which melted metal may flow; and he places this pasteboard "flask" upon the copper plate, so as to surround the writing or drawing. The patentee then takes a flat block of mahogany or other suitable wood, of the same length and breadth as the copper plate, and with one of its broad surfaces perfectly smooth and level; and in that part of this level surface which, when laid over the flask, comes opposite the channel in the broad rim, he cuts out the gate of a mould; and he lays the wooden block on the flask, with its smooth level surface in contact and its gate directly over the channel in the flask. Another pasteboard flask and another block of

mahogany are prepared in the manner just described, and applied to the back of the copper plate; and the flasks and blocks, being bound together in a vice, form two cavities or moulds, one on each side of the copper plate. An alloy, composed of bismuth, tin, and lead, in such proportions that it will melt at a temperature a little above that of boiling water, is heated until it will turn white paper to a straw color; then the cavity at the back of the plate is filled with the melted alloy, in order to heat the plate; and lastly, the cavity at the front of the plate is filled with the same. When sufficiently cool, the cast is removed from the mould. The deposited copper will be found firmly united to the alloy, forming a surface which, on the removal of the intervening alloy to a sufficient depth, will print every mark and line of the drawing previously made in the etching ground; and, to remove the alloy in these parts, dilute nitric acid must be dropped or carefully poured on the face of the plate: the acid will not attack the copper, but will reduce the alloy to powder, and, if allowed to proceed so far, would soon undermine the copper lines; but the action of the acid must be checked, before this takes place, by dipping the plate in water; and then the powder or oxide is to be removed from the surface of the plate with a stiff brush. If the cavities are not sufficiently deep, their depth may be increased by briskly rubbing the face of the plate upon or with a woollen or other suitable rough material, which will wear down the softer metal, while the copper will be comparatively unaffected; and the broader cavities may be still further deepened by the use of acids in connection with stopping-out varnishes, and by the other methods practised in finishing common copper-plate etchings. If the melted alloy, which is poured against the back of the plate, does not sufficiently heat it, the cavity at the back must be made larger, by using a thicker pasteboard flask, or in any other suitable way.

The second part of the invention consists in a method of making the sunken part of the surface in plates or blocks for printing or embossing.

The process for producing the lines and marks upon the copper plate is conducted exactly in the manner above described, until the plate has been rinsed with water, after its second immersion in the solution of per-nitrate of mercury, and is about to be dried. The plate may be dried by holding it in a hand-vice, with its face upwards, over a spirit lamp. When the plate is dry, and while still warm, the patentee removes it; and he immediately holds over the lamp

another copper plate, or small thin copper cup, containing a lump or two of common chloride of zinc, which has been exposed to the air so long (say twenty or thirty minutes) that it is deliquescing freely on the surface: the common chloride of zinc is preferred, because it deliquesces more slowly than that which has been purified. The chloride of zinc is kept over the lamp until it is brought to a temperature a little above that of boiling water, when the melted part will be a viscid fluid; and, while in this state, a thin coat of it is spread, with a soft camel's-hair brush, over that part of the plate which contains the writing or drawing. At first it may be difficult to spread this fluid evenly; but if, while the plate is slowly and gradually heated to a temperature a little higher than that of boiling water, the attempt to spread it be continued, it will soon become of such a consistence that every part of the surface may be covered with a thin and even coat; and if the heat is continued, it will soon set. The patentee allows it to set; but, as soon as it is in this condition, he withdraws the plate from the lamp and continues to move the brush, as in the act of painting, until a fluid is revived on every part of the surface: this revived fluid will not, like the other, on the application of heat, collect in spots, but will remain equally diffused.

The patentee now fixes the pasteboard flasks and blocks of mahogany on each side of the plate, as before described, and pours the melted alloy into the two cavities or moulds. When cool, the mould is to be opened; and if the work has been properly done, a plate will be formed with a surface of copper lines in the most projecting parts, and with cavities between the copper lines, formed in the process of casting by the accumulation of the chloride of zinc and the evaporation of the water united with it. In pouring the metal into the moulds, it will be best to hold them so that the copper plate will be at an angle of 45° or less with the horizon, and with its face downwards, so that the metal, in running into the front mould, may not tear away the copper lines, or carry before it the fluid between the lines. The printing or embossing plate, when first cast, should be of considerable thickness, say an eighth of an inch or more. As the cavities are made in part by the evaporation of the water which the chloride of zinc absorbs from the atmosphere, the plate must not be allowed to cool too long after the fluid begins to revive upon its surface, and before casting, as then too much water will be absorbed, and the cavities will be imperfect; and if, on the other hand, there should be too little moisture, and

the heat applied at the back of the plate should be sufficient to expel it entirely in any parts, the chloride in those parts would form a crust upon the deposited copper, which would prevent a union with the alloy, and the lines there would not be taken off: with the alloy just scorching hot, the copper plate will generally be sufficiently heated with a quantity of the melted metal equal to itself in bulk; and it will be advisable not to delay the casting more than two or three minutes after the fluid has been revived over the whole surface of the writing or drawing. Under this head of the invention, the patentee states that it is possible to make a plate having the requisite cavities for printing or embossing with the alloy alone,—the copper exposed in the lines of the etching ground being used merely to attract the melted metal, and hold it loosely until it cools.

The patentee does not confine himself to the above details. He claims, Firstly,—the method of making surfaces for printing or embossing by the combination of two substances and the subsequent partial destruction of one of them in the manner above described; whereby the less destructible substance is caused to attach itself, first slightly to a matrix or surface, which properly shapes the most projecting parts of the intended plate or surface, and then strongly to the second substance, which is afterwards partially destroyed. Secondly,—the method of making the sunken part of the surface in plates or blocks for printing or embossing, above described; whereby a substance, spread over the ground containing the matrix of the most projecting part, will, at the time of casting the plate or block, or of uniting its parts, form cavities, by acting as above explained.—[*Inrolled July*, 1848.]

To Thomas De la Rue, *of Bunhill-row, in the county of Middlesex, manufacturer, for improvements in producing ornamental surfaces to paper and other substances.*—[Sealed 15th August, 1848.]

This invention consists in certain means of producing iridescent films on the surfaces of paper and other substances, so as to ornament the same with the colors known as Newton's rings.

It is well known that steel, when heated to various temperatures below a red heat, acquires certain tints, depending on the temperature employed;—such tints being produced by the thin film of oxide of iron thus obtained on the surface

of the steel. A plate of polished iron or other metal, when placed in a solution of acetate of lead, and connected with the positive pole of a voltaic battery (the negative pole being immersed in the fluid), gradually acquires a coat of peroxide of lead, which, according to its thickness, affects light, so as to produce those beautiful colors known as Nobili's. In the Daguerreotype process, the vapour of iodine or bromine, by acting on a silver plate, produces thin films,—the colors of which indicate to the operator the proper stage to stop the process. A soap-bubble, when very thin, exhibits the most beautiful and varied tints; glass bulbs, when blown very thin, sometimes exhibit the same phenomena; and like effects are produced by plates of talc or mica, when split sufficiently thin. The foregoing remarks are made, in order that the description of colors, which the patentee obtains, may be clearly understood.

The object of this invention is effected by obtaining thin films of varnish, or other suitable matter, on the surface of fluids, and then causing such films to be transferred on to the surface to be ornamented, or by producing the films at once on the said surfaces. For this purpose, the patentee takes an open vessel, of larger dimensions than the object to be ornamented, and fills the same with clean water or other suitable fluid (preferring water); and then he places therein, below the surface of the water, the object to be ornamented—say a sheet of enamel card-board or paper. On the surface of the water, when it is tranquil, he drops a small quantity of varnish, formed by dissolving resinous or other substances in spirit, ether, or other suitable medium; or he employs other materials, such as balsams, resins, or other fluid or semi-fluid matters, capable of yielding a thin film of solid matter, and of producing the description of colors above mentioned. As the solvent of the material, or the material itself, becomes dry, the film will gradually become thinner and thinner, and an alteration of colors will take place; and then, so soon as the film has become comparatively solid, though still pliant, the enamel card-board or paper is to be raised out of the water in an inclined position: by this means the film will be caused to attach itself to the upper surface of the card-board, and the water will flow from between the film and the card-board. The card-board is now to be laid on a sloping board; when dry, it is to be finished; and it will be found to exhibit the colors due to the thin film on its surface.

If an object, such as a *basso-relievo*, or other irregular surface, is to be covered with a film, it is placed with the

ornamental surface uppermost on a perforated false bottom, furnished with handles which reach above the surface of the water in the vessel; and the operation is performed in the manner above described;—the object being raised out of the water in an inclined position. When a statue or similar object is to be ornamented, it is caused to rotate gradually as it is lifted out of the water; so that the various parts of the surface, as they come uppermost, will be covered with the film: for this purpose the article is suspended by means of wires, instead of resting on a perforated false bottom. In some cases, instead of the article being lifted out of the water, the latter may be drawn off through an opening at the bottom of the vessel; but the article must first be placed in an inclined position.

The tints produced are, to some extent, under control; and in order to obtain a desired effect, the patentee tests, by a few trials, the effect produced by the varnish to be used, by dropping the same in different quantities on to a given surface of water, and thus ascertains the exact quantity necessary to produce the required tint. It will be found that on dropping varnish on to several parts of the surface of the water, each drop will become the focus of a set of rings of color, which, by blending with each other, will form beautiful combinations; and these may likewise be curled and varied by a comb, or by blowing on the surface before the varnish sets; and tints may be changed by thinning the film before it is dry, and when on the water, by gradually drawing off portions of the film towards the side of the vessel, by means of a spatula. In order to cause the varnish, or other material, to flow readily into a film, the patentee adds a quantity of essential oil of spike lavender or other essential oil: the varnish he prefers is the ordinary white hard varnish; and he uses equal parts of varnish and oil of spike lavender.

The patentee states that all surfaces, when covered with thin films, do not exhibit the colors equally well: he particularly alludes to silver, which requires to have the surface "saddened;" and this he effects by subjecting it to the vapour of iodine or bromine, before the application of the film. Burnished black surfaces, and those which have been black-leaded, exhibit the colors very beautifully. Paper exhibits colors very perfectly, as likewise does plaster of Paris, when its surface has been previously polished by rubbing in a mixture of soap and wax. In general, very bright white metallic surfaces do not exhibit the colors.

Films may be transferred to a surface of paper or other

flexible substance, by gradually bringing such surface, when wet, in contact with the upper surface of a film; and a film may be formed on the surface of a substance, by merely wetting it sufficiently, and then dropping or applying the varnish or matter thereon.—[*Inrolled February,* 1849.]

To William Brown, *of East-street, Cambridge Heath, in the county of Middlesex, weaver, for improvements in manufacturing elastic stockings and other elastic bandages and fabrics.*—[Sealed 26th October, 1848.]

This invention consists in manufacturing elastic stockings, elastic knee caps, elastic shirts, elastic drawers, and other elastic bandages and fabrics, by weaving them in circular and other desired shapes, without a seam.

The mode of carrying out this invention is described by the patentee as follows:—"You must use a Jacquard machine, and a reed with fifty dents to an inch, and one cord to each dent, and four lashes to each cord; and the reed must be three times in length the required width of the article to be made, when contracted for use, as hereinafter mentioned. The mounture of the Jacquard machine must have eight shafts to work by quarter reeds. The warp must be upon forty-two bobbins, at the least, and it may be of silk; and if of silk, the same must be a 1050/4 treble. The shute must be India-rubber, of a number adapted to the strength of spring, or according to the elasticity required. The rule-paper must be No. 8 and 8. A diagram of the article to be made must be drawn on the rule-paper, in such a manner and of such dimensions as will be requisite for making the article in the loom three times the width required for use. In reading the rule-paper, all must be taken excepting the diagram drawn thereon, which must be left for the shafts to work; and the shafts must rise in the following manner:—For the 1st shute rise the 1st and 5th shafts; for the 2nd shute rise the 1st, 2nd, 3rd, 5th, 6th, and 7th shafts; for the 3rd shute rise the 3rd and 7th shafts; for the 4th shute rise the 1st, 3rd, 4th, 5th, 7th, and 8th shafts; and so on till the work be finished. There must be 50 shutes to the inch: namely, 25 shutes to the inch at top, and 25 shutes to the inch below. When the article is taken out of the loom, it will be three times the width required for use; and it must then be contracted by hot air to the required width, according to the ordinary methods now in use for such purposes."

The patentee claims, as his invention, the combined methods of weaving elastic fabrics circular, and other prescribed shapes, without a seam.—[*Inrolled April,* 1849.]

To William Longmaid, *of Beaumont-square, in the county of Middlesex, Gent., for improvements in treating the oxides of iron, and in obtaining products therefrom.*—[Sealed 26th October, 1848.]

This invention consists in certain modes of treating the oxides of iron, for the purpose of obtaining a black or dark colored pigment, or a volatile oleaginous product, and an imflammable gas.

The oxide of iron is finely pulverized and then mixed intimately with some carbonaceous matters. The proportions vary considerably:—the addition of 10 per cent. of carbonaceous matters would generally be sufficient; but the patentee prefers to use a little excess of carbonaceous matters; and therefore he mixes the oxide of iron with from 12 to 15 per cent. of carbonaceous matters, or such a quantity that when the process is complete a slight excess of carbonaceous matter will remain in the retort employed. Any kind of carbonaceous matters, which are not too volatile or expensive, and which can be mixed intimately with the oxide of iron, may be used; but when not in a fluid state, they must be pulverized. Those preferred by the patentee are resin and tar. When resin is used, it must be pulverized, and the oxide of iron mixed therewith in a dry state. When tar is employed, the oxide of iron is mixed therewith in a moist state, for the purpose of facilitating the incorporation of the materials; and the mixture is dried at a temperature sufficiently high to deprive it of nearly the whole of its moisture, and reduce it to a state of powder.

The mixture is to be put into retorts or close vessels; and the patentee prefers to use cast-iron retorts, of the ordinary kind, five feet in length and one foot in diameter, with a cover, to be fastened on the open end, and a ring at the opposite end, for the purpose of lifting it. A retort of this size may be charged with 1½ cwt. of the mixture; and then (the cover being secured) it is lifted by a crane, and placed in a suitable furnace, in a vertical position, with the cover end downwards, in order that the volatile products evolved from the mixture may be consumed, and thus aid in heating the retort. The heat is to be gradually raised until the whole of the retort has arrived at a low red heat; at which temperature

it must be kept until about two hours after the evolution of the combustible volatile products has ceased; and then, the process being complete, the retort is removed from the furnace, and allowed to become cold, or nearly so, before the charge is withdrawn,—as it would be injured by contact with the air whilst hot. The material produced will be black, or dark colored, and will form a good pigment for many purposes. Some carbonaceous matters, when used in the production of this material, will cause it to be sufficiently pulverulent; but, when this is not the case, it must be ground or pulverized: the pulverized matter is to be ground with oil, so as to form paint, in the usual way.

When the patentee does not intend to burn the combustible volatile products of the calcination, he lutes the cover on to the retort, so as to make it air-tight, and inserts a pipe therein to convey the volatile products to a condenser. The calcination will cause a volatile oil to be evolved from the contents of the retort, and the oil will pass through the pipe into the condenser, where it will be condensed. The calcination will also cause the evolution of an inflammable gas, suitable for the purposes of illumination; which gas must be conveyed by a pipe from the condenser to a gasometer.

The patentee claims the mode or modes of treating oxides of iron by mixing them with carbonaceous matters and subjecting them to the action of heat in the manner above described, for the purpose of obtaining one or more of the several products before mentioned.—[*Inrolled April*, 1849.]

Scientific Notices.

ON PATENT LAW REFORM.

ARTICLE IV.

From the length at which we have already dwelt on the evils resulting from the heavy tax laid on patents for invention, it may not unreasonably be supposed that we have exhausted that division of our subject; there is, however, one point still unnoticed, which is of too much importance to be omitted: this is the unenviable position in which an inventor is placed whose limited means renders it imperative that he should seek the pecuniary assistance of a capitalist in patenting his invention. We will attempt to shew the relative position of these two parties, the capitalist and the inventor;

and, in doing so, we shall be naturally led to the consideration of such of those glaring defects in the present system of granting patents as have not yet been alluded to in these papers.

As an introduction to our remarks on this part of our subject, it should be stated, that patents are granted, in this country, to "the first and true inventor," if he reside in the United Kingdom, or to the first introducer of an invention, as "a communication from abroad:" the "declaration" (which is the step preparatory to an application for a patent) sets forth, in either case, the relation in which the applicant stands to the invention he is desirous of patenting. A patent, therefore, when granted for an invention originating with a resident in this country, must be in the name of the inventor, or, otherwise, it will be liable to be set aside by a writ of *scire facias*, on the ground of fraud to the crown: to the difficulties which arise from this provision of the law we shall presently have occasion to advert. Now, the time required for passing a patent through the various stages of its progress is from four to five weeks; and, until the patent is completed by the affixing of the Great Seal, no protection is obtained by the inventor against the public use of his invention,—if a knowledge of it is, in the mean time, surreptitiously obtained; but, before this security is granted, the whole expenses of the patent must be paid. From this explanation, it will be evident that the inventor is necessitated to demonstrate, *while his improvements are yet unprotected*, the advantages derivable from his discovery, before he can hope for the assistance of a capitalist to secure the patent. But, by thus exposing his secret, he runs the unavoidable risk of its being made public, and, consequently, of losing all claim to the result of his mental labor. This is a difficulty which cannot be said to arise solely from the high charges on patents; for, if the cost were reduced to one-tenth of the sum now demanded, and the present system of granting patents were retained, there would still be a large number of inventors whose limited resources, inadequate even to the reduced demand, would place them in a similar position to that which the poor inventor now occupies,—although that number would be lessened, and the difficulties of the position would be considerably diminished, from the much greater readiness with which a small sum could be raised. The law, therefore, as it is now worked out, speaks thus in effect to the poor inventor:—If you were rich, and able to leap the impediments which cupidity, hallowed by ancient custom, has thrown in your way, the right to

enjoy the fruits of your ingenuity should be guaranteed to you; but, as your poverty leaves you without private friends, who are able to assist you in removing these obstacles to the attainment of your just dues, the public shall be allowed to appropriate your inventions, without remunerating you in any way for the mental and bodily labor which they have doubtless cost you. It is pleasant to turn from this picture of oppression to one more in accordance with the feelings of a civilized community, as exhibited in the 12th section of the American Patent Law, which was passed in July, 1836.

The section to which we refer provides, that any citizen who shall have invented any new art, machine, or improvement thereon, may, on paying into the Treasury the sum of twenty dollars, file, in the Patent Office, a caveat, setting forth the design and purpose of the invention, together with its distinguishing characteristics, and thus obtain twelve months' protection for his invention, with the option, at the end of that period, of proceeding to take out a patent—the fee already paid being considered as part payment for the patent. By this enactment "the indefeasible right of the inventor to the benefits resulting from the exercise of his own ingenuity and skill" is publicly acknowledged by the government of the United States; while we, who are ready enough to cry out against the injustice of reprinting English works in foreign countries, without the sanction of their respective authors—although the satisfaction attendant on the consequent extension of their fame is no slight reward—altogether disregard the rights of our fellow citizens to a property in their own inventions, even in their own country, and are quite ready to seize upon and apply them, if we can advantageously, without assisting their authors to either fame or fortune.

But it may be said, that for any new discovery which is likely to be really valuable, there will be little difficulty in finding some party to advance the requisite funds to patent and work it. This is an assertion which would perhaps be more truthful if capitalists could have any security for their advances, but here the difficulty of the patent being necessarily in the inventor's own name, presents itself; for, as the patentee is the only party recognized by law, as connected with the invention, until he has deposited his specification, and assigned away his right or a portion thereof, the man who finds the money will be at the mercy of him who furnishes the brains—even after the patent is secured, and a moiety assigned away—if the patentee should, from any dispute arising during the time allowed for specifying, refuse to execute the specification. To

remedy this defect in the provisions of the law, the capitalist, in order to have a hold on the patent, and obtain the power of executing the specification, is constrained to persuade himself that he is part inventor; he therefore applies for the patent in the joint names of himself and the *bonâ fide* inventor; but, in addition to being mulct of an extra sum of twenty pounds for the second name in the patent, he is also compelled to swallow something very much akin to an oath, upon making his declaration. As this is the only effectual way of getting security for the money advanced, it will be readily understood, that many men—who might otherwise be willing to engage in a speculation that offered a reasonable chance of success—would have nothing to do with a matter that involved the necessity of a transaction of the above nature, before they could protect themselves from the efforts of chicanery.

We have stated that, to pass a patent up to the Great Seal, it will require about four or five weeks,—and that the patent dates from the affixing of the Great Seal; but, in order to the attainment of a correct appreciation of our system of granting patents for inventions, it should be understood that full scope is given for rival patentees to race against each other,—the prize sought being a priority of date; the advantage of which to the winner is, that he is at once able to commence any public experiments that he may think desirable, while he shuts up his adversary for six months, and prevents him from availing himself of that period which is wisely given him for the perfecting of his invention, before specifying,—lest, by carrying on any experiments, the nature of his discovery should become known, and find its way into the specification of his more successful rival. The means of ensuring success in this kind of race are more or less at the command of those gentlemen who designate themselves *Patent Agents*; and, according to their skill, or that of their antagonists, impeded or assisted, as they sometimes are, by fortuitous circumstances, the goal is reached at a canter, or by merely a neck. It is in such struggles that the advantage of the extra fees for expedition, and the private seals (which were alluded to in our last paper) is most apparent; for, if they had no existence, the principle—that a poor inventor has no right to expect protection for his ingenuity, could not be so completely carried out as at present. There is another point worthy of remark here,—patentees are allowed either two, four, or six months, to specify their inventions. The reason for this regulation is at present immaterial. Now, the patentee who has the best of the race, and thereby gets the early seal, will also have six months allowed him to

specify; but, supposing that his opponent has only four months, he will, although his patent bears a later date, be compelled to deposit his specification first. The consequence of this is, that the first patentee can avail himself of all the improvements of the latter, by reading his specification at the Inrolment Office, and specify the same on his own behalf;—thus completely nullifying the other's patent. This statement will, we think, shew that the patent law is at least not *perfect*. The case we have assumed is, we admit, a somewhat improbable one; but it is quite possible to arise, and, with a slight alteration in the premises, it is, we believe, too frequently carried into practice.

The great marvel is, that so little roguery is enacted, while the system of our patent laws provides so effectually for its perpetration. In what more efficient way could robbery be encouraged—without indeed the abolition of punishment altogether—than by giving to the public, instead of returning to the prosecutor, the goods found on the thief. Yet such is the plan adopted with regard to inventions; for there is no means, when a patent is once granted, of transferring the right thus obtained to the party who ought in justice to enjoy it. The patent may be cancelled, at a great expense, by a proceeding at law; but this only transfers the invention from one wrongful owner to another, viz., to the public: the inventor is completely defrauded of his rights in either case.

It has often been remarked, that great discoveries have simultaneously been made by men wholly unacquainted with the proceedings or even the existence of each other. Instances of this will readily occur to the memory, as—the discovery of the Daguerreotype and electrotype processes, the electric telegraph, and, more recently, that triumph of scientific investigation, when Leverrier and Adams divided the palm. If, therefore, problems involving elaborate and abstruse calculations, or perhaps even the construction of an hypothesis from which to work out some latent property in nature, are not unfrequently found to engage many minds at the same time, and obtain two or more independent simultaneous solutions, it is not to be wondered at, when in a sphere where less difficulties are to be encountered, and more competitors are in the field, an invention should sometimes have a plurality of claimants. The only just way of deciding a question of this nature, when an invention forms the subject of two patents, is by priority of date; but, according to the present system, it is impossible for any one to make certain that his invention is not already patented; for, if A examines all the recorded

specifications which relate to the subject of his discovery, and it is not found among them, there are still the unspecified patents —amounting to about two hundred and fifty—to the particulars of which he cannot of course have access, and among these his invention may hereafter be found. If, however, we were to assume that not one of these unspecified patents had a title that would include A's invention (a very unlikely case), or that, regardless of expense, he had, for the six or even twelve months immediately preceding his application, opposed all those patents which directly or indirectly touched upon the manufacture to which his improvement referred, he could then by no means be certain that, when he had obtained his patent, he would not be superseded by a patent of prior date to his own. To understand this, it should be borne in mind, that patents are, in one respect, like Admiralty-built ships,—though they require a given time to complete, it by no means follows that they will be finished within that time, or indeed that they will ever be finished. But, as a rumour of war will frequently hasten to completion ships that have been on the stocks time out of mind, so the report of A having applied for a patent may startle B, the owner of an unfinished patent, from a slumber of several years, and induce him to push his patent to the Great Seal, lest his invention should be superseded. Of this movement of B's, A can have no knowledge, until he finds his patent in the list of those recently sealed, which list (no thanks to the government) is issued to the public, by private parties, in weekly and monthly portions. Assuming, as we do, for the purpose of illustration, that the two inventions of A and B are identical, it follows that, not only is the sum advanced by A, for his patent, expended for an illusive protection, and irretrievably lost, but the labor which he has taken in examining all prior patents, and the expense he has incurred in opposing all the recent applications, touching upon the subject of his discoveries, have proved fruitless,—from the fact, that an unperfected patent, of which there was no record, and therefore of which A could have no knowledge, was capable of being pushed to the seal before he could possibly advance his own to the same stage. If *accident* is sufficient—and our experience will bear us out in saying that it is—to produce this result, it will be readily understood that, where *design* is not wanting, the probability of its recurrence will not be lessened.

The facility with which a patentee may be anticipated by a patent of prior date, when a clue can be gained to the nature of his invention, either by an indiscreet disclosure, or

through his adopting an injudicious "title," is not generally known, even to parties who are professionally engaged in soliciting patents. We shall, however, as our object is to thoroughly lay bare the defects of our present system, explain the facilities which the law allows for the wrongful appropriation of inventions. It will be remembered that, in the first of these papers, we stated that a large proportion of the applications for patents were abandoned at various stages of their progress; and, from the above remarks, it will be understood, that these unfinished patents may, at any time, be taken up and completed. By referring to the recent Return made by order of the House of Commons, we find that there were, out of the number of applications made for patents in the respective years 1845-6-7,—

Reports granted	761	632	704
From which deduct for Patents Sealed	572	494	498
Leaving a total of Unfinished Patents	189	138	206

which may all be carried to the Great Seal if the applicants desire it. The subjects of these applications, which have passed the ordinary stage of opposition, must necessarily be various; including, perhaps, a fair sample of those branches of industry which form the staple for inventive ingenuity to work upon; such as—spinning, weaving, engine-building, telegraphing, propelling, candle-making, &c. If, then, A has become acquainted with B's invention, for, say—improvements in the manufacture of lace, for which he has commenced a patent, and A, being, unfortunately, a rogue, is desirous of appropriating to himself the advantages of that invention, he has merely to seek out from amongst those intending patentees who are the proprietors of unfinished patents—and whose number increases annually by about two hundred—a party C, who was formerly engaged in soliciting a patent for improvements in lace machinery, but who, from poverty, or some other cause, was unable to proceed with his application further than the Report, or the Bill, or the Privy Seal, as the case may be. When A has discovered amongst this class a party C, who is suited to his purpose, he enters into an agreement with him to specify B's invention, and assign that portion of the patent to himself (A) for a certain consideration: the matter is then complete. C gets his patent sealed before B, because he is, at starting, a good distance on the road; he keeps the secret of the communication, because it is his interest; A enjoys his plunder; and B, although losing his invention, and the costs of his patent, is yet comparatively a happy man, for he con-

siders his misfortune as simply an accident, and, perhaps, never discovers that he has been betrayed.

A resource is thus left open to all persons whose applications for patents are refused, by either the Attorney or Solicitor-General, on the ground of similarity of invention to that of an opposing party. Indeed, the difficulties to be met with are so trifling that we can recommend this course as a far better mode of defeating the ends of justice than the more recent means which the legislature has most generously provided for disconsolate intending patentees, under the title of "An Act for Registering Non-ornamental Designs;" for, if an invention, for which a patent has been refused, is made the subject of a registered design, there is a double risk incurred,—1st, that of its not being protected at all under that mysterious Act, of which no one as yet knows the meaning; and, 2ndly, that of its being absorbed into the specification of a patent bearing a prior date to the registration. On the whole, therefore, though the roguishly-inclined owe a debt of gratitude to the legislature for the good will which, as far as regards the surreptitious possession of inventions, has been shewn in their behalf, we think they will find that the patent law presents sufficient facilities for their purpose; while the cost of law-suits will, in the general way, guarantee them an immunity from punishment.

ON THE PREPARATION OF BROMHYDRIC AND IODHYDRIC ACID GASES.

BY M. CH. MENE.

[Translated for the London Journal of Arts and Sciences.]

M. MENE states that bromhydric and iodhydric acid gases have hitherto been prepared by decomposing phosphurets of bromine and iodine by means of a small quantity of water. Now, to say nothing of the considerable loss of matter, the serious and frequent accidents which happen during this reaction, often prevent chemists from preparing these gases, and, consequently, studying their properties. Besides this, the means proposed lately, such as essence of lemon, naphthaline, &c., being scarce and expensive products, difficult of preparation, and therefore not within the reach of a common laboratory, M. Mene thought it right to submit to the Academy (Paris) a new mode of preparation which he had recently employed with advantage at the French College, by which neither danger nor loss are incurred during reaction.

In order to disengage the bromhydric acid gas, M. Mene employs crystallized hypophosphite of lime, resulting from the preparation of phosphoretted hydrogen gas by phosphuret of

lime; this he puts into a retort with a small quantity of water, into which liquid bromine is afterwards poured by means of a funnel. The reaction takes place instantaneously, without the help of heat; and bromhydric acid is disengaged, and may be collected over mercury.

It is, however, indispensable to put into the neck of the retort some pieces of cotton or asbestos, in order to retain any vapour of bromine which might be volatilized by heat. The effect of the reaction of the bromine upon the hyposulphite of lime in presence of water may be readily conceived,—the water being decomposed.

Four parts of oxygen are taken up by the hyposulphite of lime, converting it into a neutral phosphate, and the four parts of hydrogen by the bromine, converting it into bromhydric acid.

$$4\ Br+Ph\ O,\ Ca\ O+4\ H\ O=Ph\ O^5\ Ca\ O+4\ H\ Br.$$

In order to produce iodhydric acid, M. Mene employs the same salt and uses the same means; only it is necessary to facilitate the reaction by a slight degree of heat. The decomposition of the salt by iodine is the same as by bromine.

$$4\ I+Ph\ O\ C\ A\ O+4\ HO=Ph\ O^5+4\ I\ H.$$

There is another salt of inorganic chemistry, which may serve for the preparation of these two gases.—This is sulphite of soda. In order to obtain reaction by means of this salt, it is not necessary to add water, for generally crystals of commerce contain a sufficient quantity; it is only necessary to dip them in water, and then immediately to add bromine or iodine. The addition of heat is indispensable at the commencement of the operation. The reaction produced is very simple: the bromine or iodine decompose the water in presence of the salt; one equivalent of hydrogen acts upon the bromine in order to form the gas to be collected; and the oxygen converts the sulphite into sulphate.

$$S\ O^2\ Na\ O\ HO+Br\ or\ I=S\ O^3\ Na\ O+Br\ H\ or\ I\ H.$$

M. Mene states that the preparation of these gases by means of sulphite of soda is to be preferred, as it is more easily obtained in commerce than the hyposulphite of lime, which is rather difficult to prepare. He also states that by this means he has, during about a fortnight, produced from 20 to 25 quarts of these two gases, without the least accident occurring; whilst, according to the old process, explosions frequently took place, which would have produced serious results if large quantities had been operated upon.

M. Mene gives, in conclusion, the proportions to be employed for the preparation of these two gases, which are as follows:—

By Bypophosphite of Lime.		By Sulphite of Soda.	
Water.................	1 part.	Water..................	1 part.
Iodine or bromine	5 parts.	Iodine or bromine........	3 parts.
Crystallized bypophosphite	4 parts.	Crystallized sulphite of soda	6 parts.
Total......	10 parts.	Total	10 parts.

[*Comptes rendus.*]

ON THE COMPOSITION OF STEARIC ACID.

BY MM. LAURENT AND GERHARDT.

M. M. Laurent and Gerhardt, in submitting to the Academy of Sciences at Paris the result of some experiments undertaken by them, for the purpose of ascertaining the composition of stearic acid, stated that according to some recent analyses made in Germany, under the direction of M. Liebig, by the process now generally in use, the result showing the composition of stearic and margeric acids, tended to support the theory of organic radicals, by giving to those acids formulæ similar to those of hyposulphuric and sulphuric acids. In fact these two acids, in a state supposed to be anhydrous, presented two different degrees of oxidation of the same radical $R^2\ O^5$ and $R\ O^3$, R expressing the composition of an hypothetical radical $C^{34}\ H^{66}$, of margaryle.*

Considering the analogy between the physical characteristics of these two acids, and the complete identity of their chemical changes under the influence of re-agents, there appeared to exist a doubt as to the accuracy of the formulæ which seemed to indicate so great a difference between them. On the other hand, the formula given to one of them, viz. stearic acid, was in opposition to the propositions which had been put forth as to the divisibility of the formulæ of organic substances. Either these propositions were false, or the composition of stearic acid, adopted by the school of Giessen, was incorrect. This question could only be decided by experience.

With this view MM. Laurent and Gerhardt proceeded in their experiments, which yielded the following facts:—First, that stearic and margaric acids have exactly the same atomic weight: this agrees perfectly with the results obtained by all chemists who have analyzed the salts of those substances. They next made seven separate analyses of stearic acids obtained from four different sources; and found the difference between the analyses to be only to the extent of from one to two thousandths in carbon, and scarcely one thousandth in hydrogen. These analyses led to the exact formula of margaric acid, viz.—

$$C^{17}\ H^{34}\ O^2 \dagger$$

MM. Laurent and Gerhardt also ascertained the correctness of a fact, announced some time since by M. Chevreul, viz., that pure stearic acid undergoes very little change on being submitted to distillation; it being, in this respect, similar to all other volatile acids of the same homologous series, such as formic, acetic, and butyric acids, &c. If, under certain circumstances, this distillation be accompanied by the formation of other products, such, for example, as liquid hydrocarburets, these may be entirely

* Margaric acid is $C^{34}\ H^{66}\ O^3 + H^2\ O$—

Stearic acid $2\ (C^{34}\ H^{66})\ O^5 + 2\ H^2\ O$ (bibasic) $= C^{68}\ H^{136}\ O^7$,—the oxygen being an odd or indivisible number.

† $C^{34}\ H^{68}\ O^4$ according to dualistic notation; carbon even,—hydrogen divisible by 4,—oxygen even.

avoided by distilling from 15 to 20 grammes of pure acid, and stopping the operation as soon as the last products acquire a slight brown tint. Some German chemists have been led, by observing that fusion took place at a lower temperature after distillation, to consider the product to be margaric acid; MM. Laurent and Gerhardt are however of opinion, that if any change does take place, it is without any decomposition, and can only arise from a molecular change. There exists, in fact, according to MM. Laurent and Gerhardt, between stearic acid and margaric acid, no greater difference than between tartaric and metatartaric acid: they are two physical varieties of the same chemical species; and the most fitting name for margaric acid would seem to be *metastearic acid*. This result is, besides, confirmed by all known reactions. The identity in composition and characteristics of the bodies described by M. Bussy, under the names of *margarone* and *stearone*, and of the results obtained by M. Erdmann, on an analysis of the products of the action of anhydrous phosphoric acid upon stearic and margaric acids,—and, lastly, the identity of the atomic weights of the two acids,—all these facts are now naturally explained by their isomeric state above mentioned.

The chemical history of fatty bodies is thus simplified; and the result obtained will also prove interesting in a phynological point of view, as it explains the hitherto inexplicable and, certainly, very singular difference supposed to exist between the fat of man and that of the pig and other fat animals.—[*Ibid.*]

On a phosphatometric process, for the purpose of ascertaining the quality of manures, and more particularly the black residuum of refineries.

BY MM. ED. MORIDE AND AD. ROBIERRE.

In the course of the experiments which we made upon the residuum of refineries, we employed, in order to ascertain the quantity of phosphate of lime in animal charcoal, a process to which we think proper to call the attention of agriculturists and persons desirous of analyzing manures.

Combined with the simple means given by M. Peligot, for ascertaining the quantity of nitrogen contained in any substance, the *phosphatometric* method which we employ allows of the principal elements of manures being readily discovered. We will now briefly describe this method, taking, for example, the analysis of the black residuum of a refinery:—

It is to be dried at a temperature of 100° Cent., and a certain quautity (say 1 gramme) weighed off and incinerated in a platina crucible. To the red cinder a small quantity of ammonia is to be added, in order to carbonate the lime which has been rendered caustic by the calcination, and the residuum is weighed. The difference in weight indicates the carbon and the organic matter. The cinder obtained is thrown upon a filter, and washed with boiling water; the soluble salts are thus removed by the water.

When the water of filtration no longer yields a precipitate in the presence of chloride of barium, the filter, with the washed cinder which it contains, are calcined in a platinum crucible; the residuum is then weighed, deducting the weight of the filtered cinder, which should be previously ascertained. The difference in weight of the cinder, before and after washing, gives the quantity of soluble salts in the water. This quantity rarely exceeds from one to two per cent. of the residuum.

The cinder is introduced into a closed tube, and dissolved at a low heat in the smallest possible quantity of pure nitric acid. When the dissolution is completed, the whole is poured into a glass vessel, care being taken to carefully remove the slightest traces of liquid which may be contained in the closed tube.

The liquid thus obtained contains phosphate and carbonate of lime, alumina, oxide of iron, and magnesia; it also holds in suspension silica, which might be appreciated by simple filtration, but which is not taken any notice of when the object is only to ascertain the quantity of phosphate contained in the substance submitted to analysis. The liquor is now very carefully saturated with pure ammonia, which is poured in drop by drop, stirring at the same time with a glass rod. Each drop of ammonia, as it falls into the solution, produces a precipitate of phosphate of lime, which is rapidly dissolved by agitation; but after a certain time it becomes insoluble; no more ammonia must then be supplied. It is very important that the precipitate should cause but slight cloudiness, and, with a little practice, the moment of transition may be readily ascertained: the liquor is, at that time, slightly acid. A few drops of acetic acid are added, in order to re-dissolve, as quickly as possible, the phosphate held in suspension.

We have remarked that the liquor generally remains turbid, especially if the nitric solution of the phosphate of lime is prepared at too great a heat. The operator should therefore pay great attention to this point.

The process which has been found the most simple, and at the same time the most correct and expeditious, for arriving at the quantity of phosphate of lime, consists in the employment of a normal solution of acetate of lead, which is poured into the dissolved phosphate, until the iodide of potassium indicates an excess of oxide of lead in the mixture, which has been carefully alcoholized.

For the composition of our normal liquor, we took for basis the composition of the phosphate of lead, obtained as above described. We ascertained that this phosphate was a mixture of sesquiphosphate and a small quantity of bi-phosphate of lead. Its composition was as follows:—

Phosphoric acid............	20 parts
Oxide of lead..............	80 „
	100

We have therefore based our calculations upon quantities, which experience has shewn to be constant, and we have estimated the quantity of pure acetate of lead necessary for representing 80 of oxide of lead.—This quantity is equal to 136·26. Now, 100 parts of phosphate of lead, obtained by us, represent, by their phosphoric acid, 43·85 of phosphate of lime from bones,—adopting for this latter body the formula $Ph\,O^5, 3\,Ca\,O$, admitted by M. Raewsky; consequently 310·74 will represent the quantity of pure crystallized acetate of lead necessary for saturating the acid, with 100 parts of phosphate of lime, say 3 gram. 107 for a gramme; the 3 gram. 107 dissolved in the water will constitute 50 cubic centimetres of normal liquor. A litre (about a quart) of liquor ought, therefore, to contain 62 gram. 14 of acetate of lead. Care must be taken to sharpen this liquor with a little acetic acid.

Fifty cubic centimetres of normal liquor, introduced into an alkalimetric vessel, will saturate one gramme of phosphate of lime from bones; that is to say, the vessel being graduated into 100 parts, each degree will represent one centigramme of phosphate.

The operator having filled the graduated vessel, takes a thin plate of glass, on the surface of which he deposits, with an agitator, ten drops of iodide of potassium. He then pours the normal plumbic liquor into the solution of phosphate, saturated with ammonia, as above stated, stirring it briskly after each fresh addition; phosphate of lead is immediately produced, and precipitated with remarkable rapidity.

If at this moment the end of an agitator be wetted at the surface of the mixture, so as not to touch the phosphate which is deposited, but merely the supernatant liquor, and if the drop thus obtained be brought into contact with one of the iodized drops deposited upon the glass plate, the reaction produced will easily shew whether there is or is not an excess of oxide of lead in the liquor. It will, in fact, be understood that as long as there is any phosphate to decompose, the oxide of lead of the acetate will be absorbed, and converted into phosphate of lead.

At a certain moment (and this is a fact both curious and useful) the iodide of potassium causes the liquid to assume a yellow color, at a time too when it might be supposed that the proportions were complete; but this is not the case. At this moment, the phosphate being almost entirely decomposed, the acid in excess in the liquor exercises a feeble reaction upon the phosphate of lead, and determines its solubility: this tendency to dissolve is, however, very weak, but sufficient to communicate to iodide of potassium a yellow color, which serves as a test.

This test gives a tolerably correct notion of the richness of the substance in phosphate of lime; for, as we shall presently see, this previous yellow coloring produced upon the plate of glass takes place very little before the completion of the operation.

To the liquor two thirds of its volume of alcohol are added, in order to neutralize the slight degree of solvent power possessed

by the excess of acid; and from this moment the plumbic solution is to be carefully poured in,—care being taken to stir with a glass rod, and to allow of phosphate of lead depositing, before touching the surface of the mixture with the agitator. As soon as the drop acquires a greenish-yellow color, by contact with the iodide of potassium, the operation must be stopped; the amount of phosphate contained in the manure may then be ascertained by observing the degree marked on the graduated glass.

When the acetate of lead employed is not perfectly pure, it will be necessary to make a previous experiment by dissolving a known quantity of phosphate of lime; and the result of all subsequent experiments may be ascertained by a simple calculation of proportion.

This phosphatometric operation requires but a few minutes for its execution; and furnishes results, the correctness of which it is very difficult otherwise to arrive at when phosphates mixed with alumina are to be operated upon. It may be briefly described as consisting of the following operations:—

1st. Dissolution in nitric acid of the matter deprived of its soluble salts by water.

2nd. Saturation in ammonia until the appearance of a slight precipitate, which is re-dissolved in a few drops of acetic acid.

3rd. Saturation of the phosphoric acid by means of the normal plumbic liquor.

4th. Addition of a quantity of alcohol equal to two-thirds of the whole volume, as soon as a drop obtained from the surface of the liquor causes iodide of potassium (placed upon glass) to assume a yellow color.

5th. Observation of the moment when an excess of plumbic salt appears in the liquid mixed with alcohol.

If, as stated by M. Dumas, there is any utility in ascertaining the quantity of phosphates in manures, we think we have much simplified the means of arriving at a desirable result.—[*Technologiste.*]

METHOD OF CLEANING VESSELS AND OTHER ARTICLES OF SILVER.

Boil 30 grammes of finely pulverized and calcined hartshorn in a quart of water, and while on the fire put as many silver articles in the vessel used for boiling as it will hold, and leave them there for a short time; then withdraw them, and dry them over the fire. Continue this until all the articles have been treated in the same manner. Then introduce into the hartshorn water clean woollen rags, and allow them to remain until saturated; after which, dry them and use them for polishing the silver. This is also the best substance which can be employed for cleaning locks and brass handles of room doors. When the silver articles are perfectly dry, they must be carefully rubbed with a soft leather. This mode of cleaning is excellent, and much preferable to the employment of any powder containing mercury, as mercury has the effect of rendering the silver so brittle as to break on falling.—[*Ibid.*]

METHOD OF SOLDERING CAST-IRON WITH WROUGHT-IRON.

THE following process has been recommended for this purpose:—First melt filings of soft cast-iron with calcined borax in a crucible; then pulverize the black vitreous substance which is thereby produced, and sprinkle it over the parts which are intended to be united; after which, heat the pieces of cast and wrought-iron and weld them together on an anvil, using only gentle blows. This method is peculiarly applicable for the manufacture of iron articles which are intended to be made red hot, and are required to be impervious to fluids or liquids; as such a result cannot be obtained by simple fastening.—[*Ibid.*]

MODE OF SILVERING GLASS BY THE EMPLOYMENT OF GUN-COTTON.

M. VOHL has recently discovered that a solution of gun-cotton, in a caustic ley, possesses, in a high degree, the property of precipitating silver from its solutions in the metallic form. In fact, on bringing gun-cotton into contact with a caustic ley, of sufficient strength, the cotton will become dissolved in the ley, giving out ammonia with a considerable degree of heat, and producing a deep brown liquor, somewhat thick: on pouring an acid into this, a brisk effervescence is produced, carbonic acid and nitrous acid being disengaged.

The action of the gun-cotton, in this instance, shews that it is not simply dissolved,but undergoes decomposition, by which the atoms of oxygen, in the nitric acid, enter into combination with the atoms of carbon in the cotton, thus producing carbonic acid, which, as well as the nitrous acid produced by the nitric acid, combines with one part of potash. A fresh decomposition of nitrous salt by the potash, in presence of hydrogenated substances, furnishes ammonia.

The most remarkable property of this alkaline solution is the following:—On pouring into it a few drops of a solution of nitrate of silver, and adding ammonia until the oxide of silver formed is re-dissolved (the mixture being slowly heated in a water bath), the liquor will, at a certain period, assume a deep brown color, and effervesce, the whole of the silver being precipitated on the sides of the vessel. The mirror thus produced is much superior in brilliancy to those produced by means of etherial oils or ammoniacal aldehyde; and the facility with which it is produced will doubtless render it of practical importance.

This property is not exclusively possessed by gun-cotton; it is found also in cane sugar, sugar of milk, manna, gums, and other substances which may be rendered explosive by treating them with nitric acid. Picro-azotic acid produces, under the same circumstances, a reflective metallic surface; and it appears that this reaction takes place with all bodies which, when treated with nitric acid, do not furnish products of oxidation, but another series of bodies which admit of carbonic acid forming one of their constituent parts, since they at the same time give up an equivalent of water.—[*Ibid.*]

Scientific Adjudication.

LIVERPOOL ASSIZES.

Before Mr. JUSTICE COLERIDGE,—26th, 27th, 28th March, 1849.

MANGNALL AND OTHERS *v.* BENECKE AND OTHERS.

THE plaintiffs in this case were John Mangnall and Edmund Burdekin; and the defendants were Frederick William Benecke, Martin Schunck, Charles Souchay, John Souchay, and George Gruber. The action was brought by direction of the Master of the Rolls, to decide whether or not the defendants had violated a patent granted to Thomas Ridgway Bridson, of Great Bolton, and William Latham, of Little Bolton, in May, 1838 (and by them subsequently assigned over to the plaintiffs), for "certain improvements in machinery or apparatus for stretching, drying, and finishing woven fabrics."* Mr. Martin, Mr. Crompton, and Mr. Atherton, were for the plaintiffs; and Mr. Watson, Mr. Cowling, and Mr. Webster, for the defendants.

Mr. Atherton opened the proceedings, The declaration set forth the grant of the original patent, and its infringement. The defendants, as usual, made a great number of pleas, the defence substantially being that they had not infringed the plaintiffs' patent, and that certain alternate motion forwards of two straps, in which the novelty of their (the defendants') machine principally consisted, was not invented by the plaintiffs.

Mr. Martin opened the case. The plaintiffs in this case were the assignees of a patent that was granted in 1838, to Mr. Thomas Ridgway Bridson, dyer and bleacher, at Bolton, and Mr. William Latham, a heckle maker, at the same place; and the defendants were large manufacturers, carrying on their business at Bellfield, near Rochdale; and this action was brought to establish the plaintiffs' right to the exclusive use of their patent during the three remaining years of the term for which the patent was granted. The patent, which had proved a very valuable property, was for certain improvements in stretching, drying, and finishing woven fabrics, for the purpose of giving what was called "the elastic finish." By this means the pattern was very much thrown up; the surface was much softer than in articles which had not been subjected to this operation; and a finish was given to muslins like that upon the old muslins which used to be imported from the East Indies. The original mode of finishing fabrics, which required to be stiffened, was to place them, when wet with the stiffening, in a machine, which was called a clamp machine. The web was here stretched out upon a table and held extended, by clamps on each side, until it was dry. Instead of clamps, the cloth was sometimes held fast by needle points. With both these machines the article was held stationary during the drying, and of course it dried perfectly stiff; the starch or other stiffening matter remaining in the interstices between the warp and the weft, and thus not only stiffening the threads but binding them together. This sort of finish was, however, of a very undesirable character; and in order, therefore, to make the surface of the cloth softer, and to render it less liable to crease after the cloth had been removed from the clamping machine, the sides of the cloth were moved backwards and forwards by hand, so as to give the weft a diagonal motion upon the warp. The stiffening was thus worked out of the interstices,—the indi-

* For specification of this patent, see Vol. XIV., p. 294, Conjoined Series.

vidual threads, although stiffened, were prevented from adhering together,—and what was called the "elastic finish" was given. This was the state of the manufacturing process when, several years ago, a person named Morand obtained a patent for a machine by which the web, or several webs, might be drawn forwards continuously between the side rails, whilst it was being stretched and dried, and be delivered at the other end of the rails from that at which it was put on. In this machine, the cloth was put in a wet state upon an endless chain (which ran along the side rails), at one end of these rails where they were narrower than the other. The rails became from this point gradually wider apart, and the cloth being carried on upon the chain, was thus stretched until it had attained its full width; the rails then became parallel, and the cloth was carried forwards between them through a drying stove, at such a rate that it might be dried in its passage through. There was also an arrangement in Morand's machine, by which the side rails might be placed nearer to, or further apart from, each other. By this machine, the cloth was still delivered in a stiff state, and the elastic finish had to be subsequently given by hand. In the year 1838, Mr. Bridson had his attention called to the desirableness of making a machine by which the weft threads might be moved diagonally upon the warps while the web was on the stretching and drying rails, and thus the elastic finish be given. With the assistance of William Latham, a heckle maker, he invented a machine to effect this object. The first part of his machine (for the infringement of the patent of which the present action was brought) was in substance that of Morand's. The cloth is got upon the side rails and stretched upon these as in Morand's machine. In Bridson's machine, however, the cross rails, upon which the side rails are fixed, have pivots, which rest upon sockets; and thus, when the cloth has been got upon the side rails, and has been there stretched to its full width, an alternate motion backwards and forwards (like that of a parallel ruler) can be given to the side rail, and the wefts be, in this way, made to move diagonally upon the warps. A patent for this invention was taken out in 1838; but, in 1844, a person named M'Alpine, carrying on business at Hammersmith, imitated it, and an action brought against him was tried in that year before Chief Justice Tindal. In 1848, it was ascertained that the defendants were using a machine (the invention of a person named Philippi) like that of the plaintiffs', at their works at Bellfield, and a bill in chancery was immediately filed against them; the result of which was that the Master of the Rolls had ordered the present action to be tried, in order to ascertain the right of the plaintiffs in the patent. Now the plaintiffs, in their specification, after describing their machine, go on to say:—"We would further remark, that we are perfectly aware that many simple contrivances might be devised for effecting the object of our improvements, namely, giving vibrating motion to the selvages of the cloth for the purpose above stated; but as it is not practicable to describe every possible method in detail, we desire it to be understood that any mode even of moving one side or selvage of the cloth, whilst the other remains stationary, we shall consider to be an evasive imitation of our invention, for the purpose of drawing the threads into diagonal positions by mechanical means instead of manual labour; for instance, the goods may be stretched upon ordinary 'clamp tables' (well known in the trade), and one side made to vibrate or reciprocate backwards and forwards while the cloth is drying thereon; *or the straps and pins, as described in the apparatus, and shown in the drawings, instead of travelling together, may very easily be made to*

travel independently of each other, and to progress by alternate advancing movements; or the whole apparatus may be constructed of a cylindrical form, instead of horizontally, as represented in the drawing, and have either a continuous or interrupted rotary motion, and still be so contrived as to give a reciprocating action to the selvages of the cloth distended thereon; but any of these, or similar modifications of the apparatus above particularly set out, would be merely mechanical variations of the proposed improvements in stretching, drying, and finishing woven fabrics." Now, the difference between the plaintiffs' and the defendants' machine was, that the defendants', instead of moving the side rails backwards and forwards, allowed these to remain stationary, and moved forwards the straps and pins (to which the selvages of the cloth are attached) alternately, step by step, so as in this way to bring the wefts diagonally to the warps. The alternate motion was given by half, or D-wheels, which were not in the plaintiffs' machine; and tension was given to the cloth by pulleys, attached to each side rail, instead of by screws, adjusted to the required width of the cloth, as in the plaintiffs'. The question then was, whether a machine such as that of the defendants' was an infraction of the patent-right of the plaintiffs. He then quoted *dicta* of Chief Justice Tindal and Mr. Baron Alderson, for the purpose of showing that, where a machine was substantially the same as the patented one, a mere change of details, or the substitution of mechanical equivalents in some of its parts, did not make it a different machine, so as to render it not an infringement of the former patent; and after contending that it was clear that the plaintiffs' and defendants' machines were substantially the same, and referring to the words of the plaintiffs' specification (in *italics* in the extract given above), to show that the defendants' invention was in reality only one of the modes of applying their patent which the plaintiffs had themselves there pointed out, he said that the next question would be as to the validity of the specification. He apprehended that on this point he should have no difficulty, as the specification had been already decided to be valid by Chief Justice Tindal, and subsequently by the Exchequer Chamber, sitting in error, and by the Master of the Rolls, in the course of the proceedings against M'Alpine, in 1844. The plaintiffs' specification stated that it would be impossible to tell all the means which might be devised for carrying out his invention; and he (Mr. Martin) had no doubt that fifty different gentlemen might invent fifty means of doing so; but all these would be merely different mechanical applications to carry out the object of the patent, and would not constitute a new machine. He was told it was to be said, that although the plaintiff had stated in his specification that it would be an infringement of his patent to cause the threads to move diagonally by a step-by-step movement forwards of the straps and pins, yet, that as the plaintiff had not in his specification described a mode by which that could be done, the specification was bad; but he (Mr. Martin) would call several gentlemen, who would state that this could be done by any competent mechanic, from the plaintiffs' specification. And further, it was stated that this step-by-step motion could not be applied to the plaintiffs' machine; but he should show that the plaintiffs had actually applied it to one of their machines, by a slight modification of some of its parts; and for making this modification, the defendants had threatened to bring an action against them.—He then put in the specification of the plaintiffs' patent, which having been read, the following witnesses were called.

Mr. Carpmael: I am a civil engineer. I have directed my attention

to the mode of finishing the various woven manufactures of this country. I know Morand's patent. Previously to that time, tenter frames, clamp tables, and tenter tables, were used. In the last stage of manufacturing muslin goods, some stiffening article is used. A clamping table is the entire length of the web. The tenter tables only differed from this, in having the selvages held by pins or hooks, instead of by clamps. Morand's machine consists of two rails, narrow at the end, where the cloth is put in damp, and gradually widening out, as the cloth is stretched, up to the point where the drying process begins. From that point the rails continue of the same width (that is, the utmost width of the cloth), and the cloth is dried in its passage. The difference between this machine and those formerly in use was, that, in them, one piece of cloth was put into the machine, and remained there until finished, when it was removed and another substituted; whereas, by Morand's machine, there was a continual feeding of the machine with cloth, which was dried in its passage. When the warp and weft remained at right angles, the stiffening got into the interstices, and fastened them together; but by a process called the "elastic finish," the warp and weft were moved upon each other, and thus the stiffening was removed from the interstices, while it remained in the threads. This was formerly done by hand, after the cloth had been dried;—the first machine invented for the purpose of doing it while drying being that of Messrs. Bridson and Latham. In that machine, two persons sit at the feeding end of the machine, each having hold of one selvage; they place the end of the cloth upon pins, on an endless strap; and as the selvages are put on the pins, the machine winds up the strap, so as to drag the fabric all over the table. The two rails are then caused to depart from each other, so as to stretch the cloth to the proper width. In order to keep the warp threads straight, they put on two cross-pieces, with pins at each end, so as to hold the fabric perfectly straight. In that state the operation of the patent commences, by giving motion to the side rails. The effect of that is, that there is a dislocation constantly going on, dragging the weft across the warp. That gives the "elastic finish," as opposed to the "rigid." The finish by hand was uncertain, whereas by the continuity of the machine operation, the same degree of finish is given to every part of the cloth. The same effect would be produced by making the straps travel independently of each other, and to progress by alternate advancing movements. That would cause the weft to move upon the warp in the manner I have described, except that the rubbing would be all in one direction, and that there would be no rubbing back again. The results of the two processes would be precisely the same. When the principle was once pointed out, I have no doubt that any mechanic could carry it out by his own device. No skilful mechanic, having read the specification, would have any difficulty in carrying out the object to be accomplished, by making one side of the selvage move first, and then the other. I have seen an old model of the plaintiffs', in which an alternate motion was given to the two sides of the selvage, by merely separating the two wheels upon which the endless chain is turned from the side rails, and giving them an independent motion. The endless chains, holding the selvages of the cloth, are then moved forward, one at a time, so as to bring each side of the selvage alternately forward. No person, having read the final clauses at the end of the specification, and knowing the objects suggested in the specification, would have any difficulty in making the shafts and pins "travel independently of each other, and progress by alternate advancing movements." The apparatus could also be made

in a cylindrical form as well as in a horizontal one,—a reciprocating motion being given to the cylinders. Philippi's patent was dated June 15th, 1847.* In that machine he makes use of Morand's method of narrowing the entrance,—that is, the feeding portion. The tenter rails remain fixed as to their longitudinal position, and he then gives motion to his strap by two half or D-wheels, and thus, by drawing alternately forward each side of the cloth, draws the weft threads over the warp, and takes the stiffening out of the fabric. The difference, therefore, between this machine and the modification of the plaintiffs', last described, consists merely in the employment of half instead of whole wheels,—merely a mechanical detail in the carrying out of the principle. There are numerous other mechanical means whereby the same operation may be effected. In the defendants' machine, pulleys are used to attain the distension transversely, which is produced in the other by screws and nuts, or by racks and pinions. It also admits of the succeeding pieces of fabric, connected together, being of somewhat different widths. Continuous feeding and continuous delivery would thus be attained, with a change of widths in the succeeding pieces of cloths, the ends of which are fastened to each other. These weights and pulleys are merely for the purpose of stretching, and have no other operation upon the elastic finishing. The cloths are dried on the machine by passing through a drying stove; the time of their transit and the temperature of the stove being properly adjusted, so that they will be dry when they get to the end. I should think that in this case there will practically be no difference in drying, whether the cloths move or remain stationary. M'Alpine's mode of working was to place the cloth on the side rails, which were made to move in alternate directions by excentrics. The cloth in this remained stationary in the machine. This machine attained that which is the practical end, both of the plaintiffs and the defendants,—that while the fabric is held at the two selvages, such a motion should be given to the wefts that they should move diagonally upon the warps. There are some kind of fabrics to which the distension by pulleys could not be applied; for in these (as, for instance, in a fabric for ladies' petticoats), where a thick and thin fabric alternate every few feet, the weight which would suit one fabric would be wholly unsuitable to the other. The rack and pinions will also keep the bars parallel from end to end, which would be the only convenient way of finishing such goods as must be all kept of like width. The weights are convenient where the fabrics fed in are dissimilar in width, or where there are other irregularities.—Cross-examined by Mr. Watson: I have not been practically engaged in making a machine of this kind; but I have drawn plans and given opinions as a person scientifically acquainted with the subject. I have never been either a bleacher or a dyer. I was examined in M'Alpine's case. In stretching and drying, the individual instruments and parts of the machine are not new; the diagonal motion is the only novelty. The diagonal drawing, by hand, for the purpose of obtaining this elastic finish was not new. I know the "book finish" of Scotland, which is the same as "the elastic finish." There was no elastic finish in Morand's machine. This finish had then still to be performed by hand. In performing the operation by hand, the cloth was kept in figure upon longitudinal rails, which were alternately pulled forwards and backwards. The first thing in Bridson and Latham's machine is the putting in of the cloth; the second is the stretching, which is performed in the same way as before. The taking off is by giving the

* For specification of this patent, see Vol. XXXII., p. 77, Conjoined Series.

endless chain a reverse motion, by which the piece is brought back, and re-delivered into the hands of the feeder. Bridson and Latham's machine must be the length of the piece, and you can only, by their original machine, dry one piece at a time, unless you make the machine the length of several pieces. In the plaintiffs' altered machine, while the cloth is put on, the side rails are moving to or from each other; there is continuous feeding, stretching, delivery, and drying. The endless chains are in alternate motion while the feeding is going on, so that the sides of the cloth are alternately taken on. The difference between the altered machine of the plaintiffs' and the defendants' machine is, that, in the former, alternate drivers are used, and that half-wheels are used in the latter. The plaintiffs' original machines were capable of delivering at either end. They do not now deliver at either end, but run a roller along, which takes up the cloth as it runs along. The defendants' machine will finish a piece of fine muslin goods, upon an average, in about a minute. I have never visited the bleaching works of Scotland. To make a cylindrical machine, you have only to have two wheels and pins, to receive the fabric, capable of approaching to or receding from each other, as the fabric requires; the space between the wheels to become narrower when the fabric would be narrower, in consequence of the weft threads being diagonal, and to expand when the wefts are at right angles to the warp. I should have no difficulty in making drawings to accomplish this object. The diameter of the wheels for a piece of thirty yards would be thirty feet; or the diameter might be smaller, and only a portion of a piece be done at once.—Re-examined: There would be no difficulty in making such a machine, if desired; though it would not be so convenient as the present machine. The time of drying will be the same in all the machines we have been discussing, given a like fabric, a like temperature, and like starch and water. The plaintiffs' altered machine is fed in the same way as the defendants' machine, by alternate carryings forward, and then the strap is made to move by means of pulleys. The alternate motion is much better given in this machine than in the defendants'. The original mode of delivery in the plaintiffs' machine was to deliver the cloth at the same end of the machine as that at which it was fed, by bringing the fabric back: thus, the end of the fabric that went in first would be brought out last, and that which went in last would be brought out first. There would not, however, be the slightest difficulty, if you had persons standing at the other end of the machine, in taking the cloth off there; and, on the other hand, with Morand's and the other machines, in which the delivery takes place at the other end, there would be no difficulty in returning the cloth, and delivering it at the feeding end.

Mr. Bennett Woodcroft, professor of mechanics at the University College, London, and formerly C. E. of Manchester, stated that, in his judgment, any workman of competent skill could, from the plaintiffs' specification, construct a machine, in which the straps should go forward alternately; or a cylindrical machine. The effects of the plaintiffs' and the defendants' machines are the same.—Cross examined: I consider the object of the plaintiffs' machine is, to throw the weft threads into a diagonal position with the warps by mechanical agency alone, and, in so doing, to distribute the starch equally upon each thread, which could not be done so uniformly by thumbing. There were endless straps and pins, and there was a process also for distending the cloth in Morand's patent, as well as in the plaintiffs'. There was, however, a considerable improvement in the plaintiffs' machine

in the alternate movement, and by enabling the straps and pins on each side to approach each other, in order to keep the cloth uniformly distended. In the first stage, before the cloth is stretched, both the straps on the plaintiffs' machine move together; when the cloth has come to the point where it is stretched, the straps move alternately. The processes of feeding, stretching, and finishing, are succeeding processes in all the machines. In Philippi's machine, the finishing is going on by the step-by-step movements, while the machine is being covered by the cloth; in Bridson's machines, such as they are shown in the drawings attached to the specification, the one process takes place after the other. In his altered machine the two processes go on together. The simultaneity of the two processes is pointed out in Bridson's specification, where he speaks of the straps having an alternate motion forwards, for that necessarily implies that these processes should be simultaneous. There are various modes of effecting the diagonal motion, some better than others: these various modes are not pointed out in the specification; but one good mode is pointed out. It is the best mode I know of.—Re-examined: I consider Philippi's a very inferior mode of effecting the same object.

Thomas Potter, who had been engaged in Mr. Bridson's service in the bleaching and dyeing trade for twenty-seven years, spoke to the invention of the machine in question having been made by Bridson in 1838. He also stated that no such machine had been in use in England previously, and that it was of very great utility in the business; and described the different forms of the machines in which Bridson had applied his invention.—On cross-examination, he stated that the last alteration, by which the straps were made to move forwards alternately, was made about two months ago. The modifications were made in an old machine; there was not an entirely new machine made.

Mr. Ebenezer Southworth had been brought up to the bleaching business, and had been connected with it since 1824. In the year 1838, he was in the employment of Mr. Bridson, who was then making some experiments with a view to the construction of this machine. Pins and straps were under consideration, and witness suggested an application to Mr. Latham for assistance in making this application. Latham was accordingly so applied to, and he and Bridson together brought the machine to perfection, after working at it for some months. Soon after the patent was obtained, Bridson pointed out to witness how the cloth might be carried forward, step-by-step, by alternate movements. Before Bridson's invention, there was no mode by which this finishing could be done by machinery.—Cross-examined: In the earlier machines, the fabrics were first widened out, and were then, after being finished, narrowed, in order to be taken off. The straps and pins were of no use, except in getting the cloth on.—Re-examined: It was possible to take the cloth off without slackening it, but it was most eligible to do so.

Mr. Joseph Lilly, of Manchester, engineer, examined. He said that he was well acquainted with the elastic finish, but that he did not know of any mode of effecting this by machinery before Bridson's patent. There was no difference, in their effect upon the fabrics, between the operation of the plaintiffs' and of the defendants' machine. No experienced person could have any difficulty in adapting a step-by-step motion to the plaintiffs' machine, from the instructions contained in his specification. Witness had seen the plaintiffs' altered machine, and was of opinion that the step-by-step motion was much better got

in that machine, by levers and ratchets, than in the defendants', by D-wheels.—Cross-examined: He considered that the plaintiffs' patent comprised any mechanical means for drawing the threads into a diagonal position. Had seen the plaintiffs' original and his altered machine working together; it depended upon the quality and weight of the goods, which was to be preferred. The mechanical means (the D-wheels) by which the defendants accomplished the alternate movement forward was very rude and imperfect. The same object might be much better obtained by the levers and ratchets, by an oval or round wheel, or by a screw or a cam.

Mr. Henry Barlow, consulting engineer, Manchester, spoke to the novelty of the plaintiffs' invention; to the similarity of the objects to be attained by both machines; to the ease with which the defendants' machine might be constructed from the plaintiffs' specification; and to the objectionable nature of some part of the means by which the defendants attained that object—particularly the D-wheels and the tension by pulleys.

Mr. James Fletcher, manager of the machine establishment of Messrs. Collier, Salford, said that although there was a slight difference in the mechanical means used to effect the same object in the machines of the plaintiffs and of the defendants, the result was the same. He believed that the plaintiffs' means of tension was the best.—Cross-examined: He did not see that there was any improvement in Philippi's machine. The three processes of drying, stretching, and finishing, went on together in both; and he should say there would be little difference between the time required for the operation by the one system or the other, giving the same fabric, the same quantity of starch, and the same heat.—Re-examined: The speed of Bridson's machine might be so varied as to dry, stretch, and finish from one to thirty yards per minute.

Mr. James Lilley, machine maker, Manchester; Mr. James Parke, machine maker and engineer, Bury; Mr. John Clayton, engineer, Preston; Mr. John Knight, millwright and iron-founder, Bolton; Mr. Elisha Sumner, bleacher, Bolton; Mr. Peter Rothwell Jackson; and Mr. Joseph Whitworth, machinist, were then examined at considerable length, and gave evidence to the same effect as the previous witness. Their testimony was directed to prove that the principle and object of the two machines were exactly similar, the difference between them being merely the employment of different but equivalent mechanical means to carry it out; that any competent mechanic could with ease, from the plaintiffs' specification, make a machine to work with the step-by-step motion forwards, and that the defendants' machine was to some extent inferior to the plaintiffs', particularly in the use of the D-wheels, and in the mode of giving tension to the cloth.

Mr. Crompton then proposed to put in the record in the case of *Mangnall and Burdekin* v. *William M'Alpine.*—Mr. Watson objected. How was it proposed to make this evidence?—Mr. Martin said, by the 5th and 6th William IV. c. 83, which enacts that in any action or suit, where a verdict or decree shall pass for the patentee, the judge may grant a certificate, which, being given in evidence in any other suit, shall entitle the patentee, upon a verdict in his favor, to receive treble costs. This act was amended by the 5th and 6th Vict. c. 97, which enacts that full and reasonable indemnity shall be given as to all costs, charges, and expenses incurred in and by this action.—Mr. Watson then took a further objection as to the time of putting in the certifi-

cate. His Lordship, however, overruled the objections, and the certificate of Chief Justice Tindal was then put in and read.—Mr. Martin then stated that that would be the plaintiffs' case. He had several witnesses from Scotland, but he did not think it necessary to call them.

Mr. Watson then took several objections to the plaintiffs' patent and specification. Mr. Watson then proceeded to address the jury on behalf of the defendants. He contended that the plaintiffs had only patented the vibratory motion, from which the alternate step-by-step motion was entirely different. The plaintiffs had never made a machine with an alternate motion, until the defendants had first made theirs. He then went on to describe the two machines, and to contend that they were so substantially different, that the one could not be considered as a colorable imitation of the other. The plaintiffs' machine had four distinct operations, which had to go on at different times, the putting on, the stretching, the finishing, and the taking off; while, in the defendants', all these operations went on at the same time;—in the plaintiffs' machine one piece had to be taken off before another could be put on; but in the defendants' machine one piece followed the other in continuous motion: the consequence was, that while in the plaintiffs' machine a piece took fifteen minutes finishing and drying, in the defendants' it only took about one minute. He then opened the evidence which he should call in support of his case, and stated incidentally that Mr. Philippi's patent was worth £100,000 to him.

The first witness called on behalf of the defendants was Mr. Benjamin Fothergill (of the firm of Roberts, Fothergill, and Dobinson, Manchester). He commenced by describing the construction of Morand's machine, and stating that the machinery for getting on and stretching was the same in all the machines; in Morand's, in the plaintiffs', and the defendants'. Straps and pins were used for stretching in all. In Morand's patent, the fabric was distended in a wet state, after it had been introduced. This was the case also in Bridson and Latham's machine. Their machine must be as long as the piece of goods to be placed in it for finishing. The cloth in this machine is put on square, and the next thing is to get the pulleys in gear to pull the cloth over the machine in a loose state,—the straps on both sides travelling together. If the fabric were not put on loose in this machine, the selvages would be torn. I should say (the witness continued) from the last passage in the specification, that it points out another mode of getting on; but there is no provision made for carrying this out. Several things might be employed to effect this object. If the fabrics are put on by alternate advancing movements, instead of the straps travelling together, it is necessary that the cloth should be put on in a loose state. It is more necessary to have the goods slack for the alternate advancing movement than when the sides move together. In Bridson's machine, the fabric having been got on, and distended to the proper width, the next operation, that of finishing, commences by a vibratory motion. The machinery for this purpose is Morand's transverse bars, made to reciprocate or vibrate. The vibratory machinery is to give a motion backwards and forwards to the side bars, and that motion is communicated to the transverse bars. The goods are thus stretched diagonally. The vibrating motion spoken of in the specification is the motion backwards and forwards of the selvages. This is just the same effect as was produced when one side of the cloth was pulled by hand. The finishing process

having been continued by vibrating the cloth for a sufficient length of time, the next thing is to disengage the fabric from the vibratory apparatus, by bringing the side rails together to slacken the cloth. The reversing apparatus is next thrown into gear, and the wheels are driven in the opposite direction to that in which they were first driven, so as to throw the cloth out at the end of the machine at which it entered. There is no method pointed out in Bridson's specification by which the cloth might be taken off at the other end. There is no apparatus shown in Bridson's specification for effecting any other than a vibratory motion of the selvages. In Philippi's machine, the motion of the cloth would be uninterrupted; one selvage of the cloth would always be in motion. It is set forth in Philippi's specification that the rails should be made in lengths, and should slide laterally. They do not move at all in the longitudinal direction. They must be self-adjusting by weights or springs, in order to the effective working of the machine. The motion is given to the straps and pins, which carry the selvages of the cloth, by a wheel. In Philippi's patent, as the cloth advances through it, the rails approach and recede from each other. One selvage of the cloth might be made to move while the other stood still, with D-wheels; or, by the use of different wheels, the two selvages of the cloth might be made to move continuously, though at different velocities. This unequal motion would be given by four elliptical wheels. I visited the works of the defendants at Bellfield, and also the works of Mr. Bridson, and took the time that the pieces in each machine were undergoing the operation. The time occupied in passing a piece completely through Philippi's machine was fifty seconds; and through Bridson's sixteen minutes; but the piece I saw at Bridson's had been partially dried before it came to his machine to be stretched and finished. I think from what I afterwards saw, that a piece of goods would take about the same time in passing through the plaintiff's altered machine as through his original machine. The motion of the straps in Bridson's altered machine is produced by the vibratory motion of the rails, which is made by a connecting lever at each end, to move the straps alternately. This is not self-adjusting in the way that Philippi's is. The operations of stretching, drying, and finishing are distinct in Bridson's machine; but they are one in Philippi's. As the piece enters Philippi's machine, the whole of the machine is at work for performing the different operations at one and the same time; and as the cloth passes through, it undergoes the processes of putting on, stretching, drying, and finishing at the opposite end. There was a patent taken out by a Mr. Hall, in 1834, for finishing lace, and that was the only cylindrical machine for the purpose that I ever heard of. That would not, however, be applicable to the finishing of muslin, according to Mr. Bridson's specification. Hall's machine would answer the purpose, provided I invented a vibrating apparatus, and attached it. Though a cylindrical machine is spoken of in Bridson and Latham's specification, no directions are given which would enable an ordinary workman to make it.—Cross-examined: I saw Bridson's altered machine work. It only partially did the work, as it tore the first two pieces that came up. That was done before the adjusting of the machine, and then it finished three pieces perfectly, as far as the mechanical operation is concerned. The difference between the altered machine and the original machine of Bridson is, that in the former the adjustment is made by screws, and in the latter by racks and pinions, which, in certain circumstances,

are equivalent to screws. This, with the addition of two wheels in the altered machine, and the articulation of the rails, which are brought nearer to each other where the feeding takes place (which is in Morand's machine), is the only difference between the two machines of the plaintiffs'. The altered machine did its work by a step-by-step motion. It was not self-adjusting, but, being adjusted, it did its work in the same way as in the defendants' machine. There are various ways of giving an alternating motion, which have been long known to mechanics. If the same fabric be wet to the same extent, it must dry in the same time, on whichever of the machines it be placed. The drying cannot depend upon the machine, but upon the circumstances in which the machines are placed. A heating apparatus is placed under the defendants' machine, so that the heat rises directly up to the cloth which passes over it. That is not the only mode in which heat is applied. In Morand's machine the cloth was delivered at the further end, in the same way as in Philippi's, except that Philippi has put rollers to wind up the cloth. If you take away the rollers, make round wheels instead of D-wheels, and leave out of consideration the pulleys and weights, that would be substantially Morand's machine. It would not be the same for all practical purposes, because in Morand's there are projections on the periphery of the wheels which fit into corresponding parts of the chain, preventing any slipping of it. In Bridson's original machine he had holes in his straps to catch the pins on the wheel. Whether the D-wheel is a good or bad way of accomplishing an object depends upon the machine into which it is to be introduced. There are various other means of accomplishing the step-by-step motion. The witness was then cross-examined at some length in order to show that the same effect, substantially, would be produced upon the threads of the fabric in all the machines; and that the operation of Mr. Bridson's machine upon the position of the threads was the same in one motion, as the operation of the other machine in two motions. Mr. Fothergill stated that this would be so.—Mr. Martin: Is not, then, Philippi's machine a mere combination of Morand's and Bridson's? Mr. Fothergill: It is a combination of the two machines, so far as the effect produced on the cloth, but by different mechanical means. That is to say, the elastic finish is given.—His Lordship: But are the different mechanical means simply mechanical equivalents, one for the other? Witness: They are mechanical equivalents, one for the other.—He was next cross-examined as to the operation of the weights in the defendants' patent for giving tension to the cloth, and as to its applicability to stretching successive webs of cloth of different textures: he stated that he thought the weights would be quite as good for this purpose as the method of tension employed in Bridson's altered machine.—Re-examined: Although the effect of the plaintiffs' and the defendants' machines upon the cloth is the same, it is produced by different mechanical means. And, as far as the effect goes, the same effect would have been produced by the operation of thumbing as by Bridson's machine. I never heard of an uninterrupted continuity in the motion on the selvage of the cloth until Philippi's machine was invented. When I spoke of mechanical equivalents in the two machines, I was instituting a comparison between the screws and the weights. I meant to say that the weights in Philippi's machine performed two distinct offices; one being to stretch the cloth to the required tension; the other to regulate the position of the rails when approaching and going

apart in the course of the cloth through the machine. The performance of both of those functions for giving the elastic finish was new at the time that Philippi's patent was obtained.

Mr. James Nasmyth said that all the mechanical means, used to give the elastic finish, were old before 1838, though their application to that purpose was new. The application of the mechanical means used by Philippi in his machine was new. Bridson's and Philippi's machines differed in some important particulars. In the first, the effect was produced by bars vibrating upon centres; while in the second, the motion was step by step, and there was no reciprocation or vibration. There were some important differences between Philippi's machine and Bridson's altered machine; but the latter is an attempt to accomplish the same object as the former. He did not think Bridson's machine so good as Phillippi's. He thought that the contents of Bridson's specification were too vague to enable any one of ordinary mechanical skill to make a machine to advance the cloth with a step-by-step motion.—Cross examined: He never saw the machines at work. In some important particulars, Philippi's machine embodies the contrivances of Morand and Bridson, but there are important differences. With the exception of the weights and pulleys, there is not any substantial difference between Philippi's machine and a combination of Bridson's and Morand's. There is not the slightest difference in the result of the two machines upon the fabric. I think the weights in Philippi's machine are a great improvement, as introducing an important element of self adjustment.—Re-examined: The continual progression of the cloth in Philippi's machine is a very important improvement. In Bridson's original machine, the centre thread cf the piece is stationary, while in Philippi's it is not: the difference, though subtle, is important.

Mr. Thomas Briggs, machine maker, Manchester, never knew a machine before that of Philippi's that would accomplish the putting on, stretching, and finishing of a piece at the same time—nor that would allow several pieces of cloth to go through the machine one after the other. Bridson's machine would not accomplish either of these objects.

The defendant then called several other witnesses, some of whom gave evidence in corroboration of Mr. Fothergill and Mr. Nasmyth, while others, principally foremen or workmen in machine-making establishments, were called to show that from the latter part of the plaintiffs' specification, beginning "we would further remark" (quoted in Mr. Martin's opening speech), they could not have made a machine in which the straps should advance alternately, or of which the form should be cylindrical. As, however, his lordship subsequently, in charging the jury, said that he should himself, if the question turned upon that part of the specifiation, hold it to be insufficient, it is not necessary to give this evidence.

Mr. Martin then replied. The question to be tried was, not the superiority of the defendant's machine over the plaintiff's, but had Philippi, in making his machine, availed himself of the discovery made by Mr. Bridson in 1838; for if he had, he had made merely an addition to the plaintiff's machine, and he would be entitled to a verdict. If a patentee laid down a principle, and then specified a mode of carrying out that principle, he was entitled to be protected against all other modes of carrying out the same principle. Now, the principle of the defendant's machine was precisely the same as the plaintiff's; in both, the weft threads were moved diagonally upon the warps, so as to break

up the starch in the interstices; and in both this was done by drawing a paralellogram into a paralellopiped. Supposing that the plaintiff's patent had been merely taken out for the backwards and forwards motion, he could not suppose that the jury would doubt that the defendant's machine was substantially the same as the plaintiff's; but Philippi had not even the merit of having exercised much ingenuity or invention in making his machine, after the last clause of the plaintiff's specification, in which he had distinctly pointed out that the object of his machine might be accomplished by giving the straps and pins an independent alternate motion, step by step forwards. Mr. Fothergill and Mr. Nasmyth had proved the plaintiffs' case as clearly as any of his (Mr. Martin's) witnesses could have done; for they told the jury that the defendants' machine, setting aside the weights and pulleys, was nothing more than a combination of Bridson's and Merand's; and he had no doubt that if this action had been one brought by the defendants, for the infringement of Philippi's patent, they would have been nonsuited, after the evidence of these witnesses. And with regard to the weights and pulleys, if they had been of any value, would not some witnesses, who had seen the machine at work, have been called, to state the advantages which they conferred? It now being admitted that Bridson's invention was most useful; the validity of his specification having been established by a long judicial inquiry four years ago; and any one having had the means of consulting it, and seeing how the object was effected,—he would ask the jury whether that gentleman was not entitled to be protected against any invention, the principle of which was so clearly taken from his specification as was Philippi's. No patent would be worth the parchment upon which it was written, if a man, knowing what was the object to be attained, could sit down and, by a mere variation of mechanical equivalents, do the same thing.

His Lordship then proceeded to sum up, and, after getting rid of the issues as to whether Bridson and Latham were or were not joint inventors; as to whether the title of the patent properly described the nature of the machine patented; and the validity of the specification, —on all of which points he intimated an opinion in favor of the plaintiff, his lordship came to whether or not the defendants had been guilty of any infringement. With regard to this point, his lordship said: It is now necessary to look to what the plaintiff in the first place claims. He claims that he has made an invention for the improvement of machinery for the finishing of woven fabrics. He has applied the old principle of thumbing—or rather, he has devised a mechanical mode for the doing that by a machine, which was to work in a vibratory manner, causing the weft thread of the fabric to move in a diagonal direction upon the warp; the effect of which was, while it was in the moist state, to remove the starch from the interstices or meshes, so as to bring out the threads; and, while they were made more solid and thicker, to make the whole fabric more solid and elastic. Now that was done, in the first instance, by what has been called, throughout this cause, the vibrating machine. Having done so (about which there appears no question), he is entitled, having obtained a patent, to be protected in the use of that. He is not only entitled to be protected in the use of that against a man who should make an exactly similar machine, and do the same thing in an exactly similar way; but he is also entitled to be protected against any person who shall produce the same result by a colorable imitation of the means. It is not enough, in order to show that there has been an

infringement, to show that a man has invented a machine by which the same result as that attained by the patented machine is arrived at; because that would be to bar all great improvements. And if you are of opinion that the defendant, pursuing a totally different, distinct, and separate way, had arrived at the same result, whether for better or worse, then that would not be an invention against which the plaintiff has a right to be protected. He has a right to be protected against what I call a colorable imitation of the thing. If the defendant has taken the same principle as the plaintiff, and has used it so as to work in the same way on the same subject-matter, so as to produce the same result, the only difference being that he has varied the mechanical agent by which he has done it, then I think that it is merely a colorable imitation, and it amounts to an infringement of the patent. It has been stated by the witnesses called on both sides that it is often to them a matter of perfect indifference which mechanical agent they use to effect the same result. And if, therefore, there be only such a difference as this in the mechanical agent, the plaintiff has as much right to be protected against an infringement by one of these mechanical equivalents as he would have been if exactly the same means had been made use of. If this were not so, there would be no means by which a patentee's title could be at all protected, unless he specified in his claim every possible mode by which the thing could be arrived at; which, of course, would be very unreasonable to expect. You must deal with these things as with all other things, according to the subject-matter; you must so consider them. His lordship then said that the first question the jury would have to consider was, whether the defendants' machine was or was not a colorable imitation of the plaintiffs' original machine (for he would leave the altered machine out of the question at present), and he then, after stating that he considered that the merits of the two machines had been uselessly and improperly introduced into the discussion, since they had no bearing upon the question at issue, proceeded to read and comment upon the evidence of Mr. Carpmael (the principal witness for the plaintiffs), and Mr. Fothergill (the principal witness for the defendants), with a view to arrive at a solution of this question. After reading the evidence upon this point, his lordship discussed the question as to the sufficiency of the latter part of the plaintiffs' specification, for the making of a machine with an alternate step-by-step motion; supposing the jury should be of opinion that such a machine would be really a distinct and separate machine from his original vibratory machine; and he said that the weight of evidence tended to show that such a specification would not have enabled an ordinary machine maker to make such a step-by-step advancing machine, without making experiments and trials, and that therefore, in that case, the specification would be bad. If, however, the altered machine were no more than something that was included under the machine fully described in the early part of the specification, and was merely a variation of that, then an infringement of the altered machine would, of necessity, be an infringement of the original one also. That, therefore, was the question which he should leave to the consideration of the jury.—Mr. Watson suggested that his lordship should say whether the plaintiffs' original and the altered machines were or were not one.—His lordship then said, that taking Mr. Carpmael's evidence on the one side, and the admissions made by Mr. Fothergill on the other, the evidence seemed to him to make out that the ma-

chines were the same. For there was only a difference in the employment of different but equivalent mechanical means to produce the same result, by the same sort of operation, on the same subject-matter, by working in the same way the weft upon the warp.

The jury then proceeded to consider their verdict, and after consulting together in their box for about ten minutes, they returned a verdict for the plaintiff on all the issues.

Mr. Watson, for the defendants, intimated his intention of tendering a bill of exceptions to his lordship's summing up, and to his ruling of the points of law raised by the defendants' counsel.

ROLLS' COURT.—*Wednesday, April* 16.

MANGNALL AND OTHERS *v.* BENECKE AND OTHERS.

Mr. Turner and Mr. Humphreys, for the plaintiffs, Thomas Ridgway Bridson and John Mangnall, moved for an injunction to restrain the defendants, Frederick William Benecke, Martin Shunck, John and Charles Souchay, and others, from further using and employing, and from causing or permitting to be used or employed, the several machines made upon the principle of the invention in respect of which letters patent of the 26th of May, 1838, were granted, in or about the stretching, drying, or finishing any muslin, or other woven fabrics, and from making, or causing to be made, any other machines of the like nature, and from in any manner practising or exercising the invention in the plaintiff's bill mentioned, or from infringing his letters patent. The bill stated that previous to May, 1838, the plaintiff Bridson had invented certain improvements in the mode of stretching, drying, and finishing woven fabrics, and in the machinery or apparatus by which such improvements were to be effected, and that the plaintiff having been therein assisted by William Latham, it was agreed between them that the patent should be applied for in the names of Bridson and Latham, and upon their petition letters patent of the 26th of May, in the first year of the Queen, were granted. The motion for an injunction was made on the 31st of January last, when the Court ordered the motion to stand over, and directed the trial of an action at law to be had at Liverpool. That trial took place before Mr. Justice Coleridge, and occupied three days, and a verdict was given in favour of the plaintiff Bridson's patent. He (Mr. Turner) now moved upon the event of that trial for the injunction. A bill of exceptions had been tendered. The defendants had pleaded to the action—"Not guilty;" that the specification did not describe the particulars of the invention; that Bridson was not the first inventor; and that the invention was not new. He now submitted that, notwithstanding the bill of exceptions, the plaintiff was entitled to the injunction.

Mr. Roupell, Mr. Cole, and Mr. Webster, for the defendants, opposed the motion.

Lord Langdale said, the effect of the bill of exceptions might be to prevent the verdict from ever coming to be a judgment; but, as the Court was not to be absolutely bound by a verdict, although it ought not to disregard it, the Court would act according to the circumstances of each particular case, and he thought that he ought to grant the interlocutory injunction. The injunction must be granted, and the costs to be costs in the cause.

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1849.

Mar. 27. *John Shillicorn*, of 20, Park-lane, plumber and glazier, and *William Henry Ogden*, of 29, Sefton-street, Liverpool, iron-founder, for an improved multiplex water-closet.

28. *Joseph James Welch & John Stewart Margetson*, both of 134, Cheapside, in the City of London, for the "University jacket."

28. *George Osborne*, of Goudhurst, Kent, for a portable commode.

28. *Brown, Marshall, and Co.*, of Birmingham, for a railway waggon.

29. *Henry Foster*, of 20, Waterloo-road, and *John Foster*, of Liverpool, in Lancashire, for an improved telegraphic ship signal-lantern.

30. *William Bennett*, of 36, Percival-street, Goswell-street, Clerkenwell, for a shaving-brush.

31. *Richard Jones*, of Carr-street, Ipswich, engineer, for an improved fire-escape.

31. *John Whitehead*, of Preston, for a reciprocating spiral motor.

April 3. *Benjamin Nicholl*, of 42, Regent-circus, and 46, Lombard-street, London, for a jacket for rowing, cricketing, &c.

3. *Francis Baildon Oerton*, of Walsall, for a bit for horses.

3. *Richard Garrett*, of 64, King-street, Whitehall, London, for the double-piston cornopean.

4. *George Carrington*, of Birmingham, for a wedding-ring strainer.

5. *John Howard & Son*, of Britannia Iron Foundry, Bedford, for an improved horse-drag rake.

7. *Stephen Hartley*, of No. 1, Alpha-place, Manor-street, Chelsea, for an artificial bird-shooting machine.

10. *Michael James Brown*, of Oundle, Northamptonshire, machine-maker, for an improved tile and pipe machine.

10. *Bryan, Donkin, & Co.*, of the Engineers' Works, near the Grange Road, Bermondsey, for an improved cock for water, steam, gas, &c.

11. *George White*, of Jersey, master of St. Mark's school, for a chimney-pot or ventilator.

12. *Thomas Walker*, of Birmingham, for a rotating-heel for boots and shoes.

13. *William Cook*, of King-street, Regent-street, London, for transverse or cross connectors to inverted double C-springs and others.

14. *Alexander Speirs*, of Vauxhall Foundry, Liverpool, for an improved hydrant or water valve.

Apr. 14. *Alexander Robertson*, of 22, Bachelors'-walk, in the City of Dublin, surgical instrument-maker, for a gum elastic breast reliever.

14. *Henry Thompson*, of 116, Long Acre, camp equipage manufacturer, for a jaw for metallic joint, applicable for the construction of camp and other bedsteads.

16. *Joseph James Welch & John Stuart Margetson*, both of 134, Cheapside, in the City of London, for an elastic improved aerial stock or tie.

16. *William Arkell & William Jackson*, of 38, Wincheomb-street, Cheltenham, Gloucestershire, coach-builders, for a fore-carriage framing.

16. *William Gent*, of Bennett's-hill, Birmingham, hosier, for the Gemini coat.

17. *Joseph Wilson & Charles Penny Woodfin*, of Hull, iron and brass-founders, for a double stench trap.

18. *Henry Alexander Bodrin*, of 13, George-street, Pentonville, for a false bottom and tube for flower-pots.

18. *George Forrester & Co.*, of Vauxhall Foundry, Liverpool, for parts of a hydrant.

19. *Samuel Suter*, of Birmingham, for a scratch-brush.

19. *Henry Woodfull*, of Foot's Cray, Kent, paper-maker, for a water-mark to be applied to writing-paper,—the diagonal lined paper.

20. *John Classon*, of 3, Blackhall-place, Dublin, for a denoter of time.

21. *James Kean*, of Sunderland, for a machine for making bricks and tiles.

23. *Henry Field*, of 65, Argyle-street, Glasgow, tin-plate-worker, for a gas-heater for baths and other purposes.

23. *Richard Hornsby*, of Lincoln, agricultural implement-maker, for a portable farm-engine boiler.

24. *Joseph William Schlesinger*, of Clement's-lane, London, for a revolving blotter.

25. *Thomas Key*, of 20, Charing-cross, London, musical instrument-maker, for a compensation valve-rod for cornet-à-pistons, trumpets, horns, &c.

25. *John Scott*, of Tixall, Staffordshire, for Remington and Scott's bridge.

25. *James Phillips & George Hunt*, of Birmingham, for a shell back of wood for a button.

26. *John Goodman, M. R. C. S.*, of Manchester, for the "hydro-vapour bath."

26. *Samuel Grew & James Crawford*, of Rugby, for a cramp for coupling and uncoupling railway carriages.

27. *Samuel Reston*, of Aldersgate-street, City of London, for life-preserver braces; with air-tight mouth-piece attached, adapted for other uses.

List of Patents

That have passed the Great Seal of IRELAND, from the 17th March to the 17th April, 1849, inclusive.

To John Harris, of No. 4, Richard's-terrace, Albion-street, Rotherhithe, in the county of Surrey, engineer, for a mode or modes of founding type, and of casting in metal, plaster, and certain other materials.—Sealed 24th March.

Walter Richard, of Edinburgh, in the kingdom of Scotland, type founder, for improvements in casting printing types and other similar raised surfaces; and also in casting quadrats and spaces, —being a foreign communication.—Sealed 3rd April.

James Henry Staple Wildsmith, of the City-road, experimental chemist, for improvements in the purification of naphtha, likewise called wood spirit; and hydrated oxide of methyle, pyroligneous acid, and eupion, and certain other products of the destructive distillation of wood, peat, and certain other vegetable matters, and of acetate of lime and shale; and in the purification of coal-tar and mineral naphtha; likewise spirit, being the products of fermentation.—Sealed 3rd April.

List of Patents

Granted for SCOTLAND, subsequent to March 22nd, 1849.

To Charles Henri Paris, of Paris, in the Republic of France, manufacturer, for improvements in preventing the oxidation of iron,—being a communication.—Sealed 26th March.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, C. E., for improvements in machinery for hulling and polishing rice and other grain or seeds.—Sealed 26th March.

James Fletcher, of Salford, in the county of Lancaster, manager at the Works of Messrs. William Collier and Co., of Salford aforesaid, machinists and tool makers, and Thomas Fuller, of Salford aforesaid, machinist and tool maker, for certain improvements in machinery, tools, or apparatus for turning, boring, planing, and cutting metal and other materials.—Sealed 26th March.

Walter Neilson, of Hyde Park street, in the city of Glasgow, engineer, for a certain improvement or certain improvements in locomotive engines. Sealed 27th March.

Jean Adolphe Carteron, of Paris, in the Republic of France, now of the Haymarket, in the county of Middlesex, chemist, for certain improvements in dyeing. Sealed 27th March.

David Henderson, of the London Works, Renfrew, Scotland, engineer, for improvements in the manufacture of metal castings. Sealed 29th March.

William Longmaid, of Beaumont-square, in the county of Middlesex, Gent., for improvements in treating the oxides of iron, and in obtaining various products therefrom.—Sealed 4th Apr.

Francis Hay Thomson, of Hope-street, in the City of Glasgow, North Britain, D. M., for an improvement or improvements in smelting copper or other ores.—Sealed 11th April.

Clemence Augustus Kurtz, of Wandsworth, in the county of Surrey, Gent., for certain improvements in looms for weaving; being a communication.—Sealed 11th April.

Barthelemy Thimounier ainé, of Amplepuis, Department du Rhone, in the Republic of France, engineer, for improvements in machinery for sewing, embroidering, and for making cords or plats.—Sealed 11th April.

Alfred Vincent Newton, of the Office of Patents, 66, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in the manufacture of piled fabrics,—being a communication.—Sealed 13th April.

Arthur Dunn, of Dalston, chemist, for improvements in ascertaining and indicating the temperature and pressure of fluids. —Sealed 13th April.

Jeremiah Brown, of Kingswinford, in the county of Stafford, roll-turner, for certain improvements in rolls, and machinery used in the manufacture of iron; also in rolls and machinery for shaping or fashioning iron for various purposes.—Sealed 13th April.

William M'Bride, jun., of Sligo, in the Kingdom of Ireland, but now of Havre, in the Republic of France, merchant, for improvements in the apparatus and process for converting salt water into fresh water, and in oxygenating water,—being a communication.—Sealed 16th April.

John Ruthven, engineer, Edinburgh, Scotland, improvements in preserving lives and property from water and fire, and in producing pressure for various useful purposes.—Sealed 17th Apr.

William Henry Balmain, and Edward Andrew Parnell, both of St. Helens, in the county of Lancaster, manufacturing chemists, for improvements in the manufacture of glass, and in the preparation of certain materials to be used therein; parts of which improvements are also applicable to the manufacture of alkalies.—Sealed 17th April.

Stephen White, of Victoria-place, Bury New Road, Manchester, in the county of Lancaster, gas engineer, for improvements in the manufacture of gases, and in the application thereof to the purposes of heating and consuming smoke; also improvements in furnaces for economising heat, and in apparatus for the consumption of gases.—Sealed 19th April.

Charles Alexandre Broquette, of Rue Neuve St. Nicholas, St. Martin, in the Republic of France, chemist, for improvements in printing and dyeing fibrous and other materials.—Sealed 20th April.

Soren Hjorth, of Jewry-street, Aldgate, in the City of London, for certain improvements in the use of electro-magnetism, and its application as a motive power, and also other improvements in its application generally by engines, ships, and railways.—Sealed 20th April.

James Hart, of Bermondsey-square, engineer, for improvements in machinery for manufacturing bricks and tiles, parts of which machinery are applicable to moulding other substances. —Sealed 20th April.

New Patents
SEALED IN ENGLAND.
1849.

A Grant of an Extension of Her Majesty's royal letters patent, for the term of four years, from the 4th day of April instant, to Charles Geach and Thomas Walker, assignees of James Hardy, the original patentee of an invention for a certain improvement or certain improvements in the making and manufacturing of axletrees for carriages, and other cylindrical and conical shafts. Sealed 2nd April.

William Mc Bride, Jun., of Sligo, in the Kingdom of Ireland, but now of Havre, in the Republic of France, merchant, for improvements in the apparatus and process for converting salt water into fresh water, and in oxygenating water,—being a communication. Sealed 2nd April—6 months for inrolment.

Alfred Vincent Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in separating and assorting solid materials or substances of different specific gravities,—being a communication. Sealed 2nd April—6 months for inrolment.

Samuel Alfred Carpenter, of Birmingham, manufacturer, for a certain improvement in, or substitute for, buckles,—being a communication. Sealed 3rd April—6 months for inrolment.

Alfred Woollett, of Liverpool, artist, for improvements in gun-carriages. Sealed 3rd April—6 months for inrolment.

William Parry, of Plymouth, Esq., for certain improvements in shoeing horses and in horse-shoes. Sealed 3rd April—6 months for inrolment.

Henry Dunington, of Nottingham, manufacturer, for improvements in the manufacture of looped fabrics, and in the making of gloves and hat-bands. Sealed 3rd April—6 months for inrolment.

James Godfrey Wilson, of Chelsea, engineer, and William Pidding, of Elizabeth-street, Pimlico, for improvements in obtaining perfect combustion, and in apparatus relating thereto; the same being applicable to every description of furnace and fire-

place, as also to other purposes where inflammable matter or material is made use of. Sealed 3rd April—6 months for inrolment.

Gaspard Brandt, of Little Gray's Inn-lane, machinist, for improvements in the construction of the bearings of railway engines and railway and other carriages now in use. Sealed 13th April—6 months for inrolment.

James Childs, of Earl's-court-road, Old Brompton, wax bleacher, for improvements in the manufacture of candles, night-lights, and candle-lamps. Sealed 16th April—6 months for inrolment.

Thomas Cocksey, of Little Belton, in the county of Lancaster, millwright, and James Nightingale, of Breightmet, in the said county, bleacher, for certain machinery to facilitate the washing and cleansing of cotton and other fabrics; which machinery is applicable to certain operations in bleaching, dyeing, printing, and sizing warps and piece goods. Sealed 16th April—6 months for imrolment.

Louis Prosper Nicholas Duval Piron, of Paris, engineer, for certain improvements in tubes, pipes, flags, curbs for pavement, and tram-roads. Sealed 16th April—6 months for inrolment.

Charles Shepherd, of Leadenhall-street, chronometer-maker, for certain improvements in working clocks and other time-keepers, telegraphs, and machinery, by electricity. Sealed 16th April —6 months for inrolment.

Robert Clegg, Joseph Henderson, and James Calvert, of Blackburn, manufacturers, for certain improvements in looms for weaving. Sealed 16th April—6 months for inrolment.

John Ruthven, of Edinburgh, engineer, for improvements in preserving lives and property from water and fire, and in producing pressure for various useful purposes. Sealed 16th April—6 months for inrolment.

William Henry Phillips, of York-terrace, Camberwell New-road, engineer, for improvements in extinguishing fire; in the preparation of materials to be used for that purpose, and improvements to assist in saving life and property. Sealed 16th April —6 months for inrolment.

William Little, of 198, Strand, for improvements in the manufacture of materials for lubricating machinery,—being a communication. Sealed 16th April—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in machinery for the manufacture of net lace or other similar fabrics,—being a communication. Sealed 16th April—6 months for inrolment.

William Hyde Knapp, of Long-lane, Boro' of Southwark, chemist, for improvements in preparing wood, for the purposes of matches and fire-wood. Sealed 17th April—6 months for inrolment.

Thomas Nicholas Greening, of the Firm of Messrs. Burdekins and Greening, of Sheffield, cutlery manufacturers, for improvements in knives and forks. Sealed 17th April—6 months for inrolment.

Alexander Alliott, of Lenton Works, Nottingham, bleacher, for improvements in apparatus for ascertaining, and for marking or registering, the force and pressure of wind, of water, and of steam, the weight of goods or substances, and the velocity of carriages; also in apparatus for ascertaining, under certain circumstances, the length of time elapsed after carriages have passed any given place; and for enabling the place or direction of floating bodies to be ascertained. Sealed 17th April—6 months for inrolment.

George Remington, of Warkworth, in the county of Northumberland, civil engineer, for certain improvements in locomotive, marine, and stationary steam-engines; and in hydraulic and pneumatic engines. Sealed 17th April—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in boilers or steam-generators,—being a communication. Sealed 17th April—6 months for inrolment.

Henry Bessemer, of Baxter House, in the county of Middlesex, engineer, for improvements in the methods of extracting saccharine juices from the sugar-cane, and in the manufacture of sugar; also in the machinery or apparatus employed therein. Sealed 17th April—6 months for inrolment.

John Ormerod, of Holt Holme Mill, Manchester, spinner, for certain improvements in carding cotton and other fibrous substances. Sealed 19th April—6 months for inrolment.

Robert Gordon, of Heaton Norris, Lancashire, engineer, for certain improvements in the ventilation of mines. Sealed 19th April—6 months for inrolment.*

Charles Alexander Broquette, of Rue Neuve St. Nicholas, St. Martin, in the Republic of France, chemist, for improvements in printing and dyeing fibrous and other materials. Sealed 21st April—6 months for inrolment.

William Kilner, of Sheffield, in the county of York, engraver, for improvements in manufacturing railway and other axles, and wheels and machinery to be employed in such manufacture. Sealed 24th April—6 months for inrolment.

Lewis Vernet, of Buenos Ayres, for a method of preserving from destruction by worms, insects, decay, and fire, certain vegetable and animal substances. Sealed 24th April—6 months for inrolment.

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* This patent having been opposed at the Great Seal, was not sealed till the 19th instant, but bears date the 4th, the day it would have been sealed had the opposition not have been entered.

Thomas Harcourt Thompson, of Blackheath Hill, civil engineer, for certain improvements in apparatus for preventing the rise of effluvium from drains, sewers, cesspools, and other places, and in apparatus and machinery for regulating the levels of waters in rivers, reservoirs, and canals. Sealed 26th April.—6 months for inrolment.

George Simpson, of Newington Butts, chemist, and Thomas Forster, of Streatham, manufacturer, for improvements in manufacturing or treating solvents of India-rubber and of other gums or substances. Sealed 26th April—6 months for inrolment.

John Barsham, of Chelmsford, in the county of Essex, manufacturer, for improvements in separating the fibre from cocoanut husks. Sealed 26th April—6 months for inrolment.

Charles Iles, of Bordesley Works, Birmingham, machinist, for improvements in manufacturing picture-frames, inkstands, and other articles, in dies or moulds; also in producing ornamental surfaces. Sealed 26th April—6 months for inrolment.

William Faulconbridge, of Long-lane, Bermondsey, in the county of Surrey, for improvements in the manufacture of hose-pipes, driving-bands, and valves for atmospheric railways. Sealed 26th April—6 months for inrolment.

Bartholomew Beniowski, of Bow-street, Covent Garden, Major in the late Polish Army, for improvements in the apparatus for and process of printing. Sealed 26th April—6 months for inrolment.

Robert Oxland, of Plymouth, chemist, and John Oxland, of the same place, chemist, for improvements in the manufacture of sugar. Sealed 26th April—6 months for inrolment.

William Henry Burke, of Tottenham, manufacturer, for improvements in the manufacture of airproof and waterproof fabrics, and in the preparation of caoutchouc and gutta-percha, either alone or in combination with other materials; the same being applicable to articles of wearing apparel, bands, straps, and other similar useful purposes. Sealed 26th April—6 months for inrolment.

John Horsley, of Ryde, in the Isle of Wight, practical chemist, for certain improvements in preventing incrustation in steam and other boilers; also for purifying, filtering, and otherwise rendering water fit for drinkable purposes. Sealed 26th April—6 months for inrolment.

Alphonse Garnier, of Paris, in the Republic of France, but now of South-street, Finsbury, merchant, for certain improvements in extracting and preparing coloring matter from orchil,—being a communication. Sealed 28th April—6 months for inrolment.

CELESTIAL PHENOMENA FOR MAY, 1849.

D.	H.	M.	
1			Clock after the ☉ 3m. 3s.
	—		☽ rises 1h. 6m. A.
	—		☽ passes mer. 8h. 3m. A.
	—		☽ sets 2h. 21m. M.
3	7	43	☿ in sup. conj. with the ☉
	14	53	♃ in □ with the ☉
	20	58	☿ in the ascending node
5			Clock after the ☉ 3m. 29s.
	—		☽ rises 5h. 33m. A.
	—		☽ passes mer. 11h. 4m. A.
	—		☽ sets 4h. 2m. M.
	—		Occul. 95 Virginis, im. 10h. 25m. em. 11h. 25m.
	—		Occul. *k* Virginis, im. 15h. 8m. em. 15h. 42m.
	10	40	♃'s first sat. will em.
7			Occul. *y* Libra, im. 11h. 15m. em. 12h. 35m.
	7	7	Ecliptic oppo. or ○ full moon
	17	51	☿ in conj. with Vesta, diff. of dec. 4. 46. N.
8			Ceres stationary
	1	32	☿ in conj. with ♀ diff. of dec. 3. 39. S.
	10	35	☿ in Perihelion
9	9		☽ in Apogee
	10	50	♃'s second sat. will em.
10			Clock after the ☉ 3m. 50s.
	—		☽ rises 10h. 29m. A.
	—		☽ passes mer. 2h. 6m. M.
	—		☽ sets 6h. 34m. M.
11	10	14	♃'s fourth sat. will im.
	18		♂ greatest hel. lat. S.
12	5	28	♀ in inf. conj. with the ☉
18			Mercury R. A. 4h. 6m. dec. 22. 24. N.
	—		Venus R. A. 3h. 11m. dec. 21. 14. N.
	—		Mars R. A. 23h. 49m. dec. 2. 49. S.
	—		Vesta R.A. 3h. 29m. dec. 15. 0. N.
	—		Juno R. A. 7h. 25m. dec. 14. 49. N.
	—		Pallas R. A. 18h. 13m. dec. 22. 1. N.
	—		Ceres R. A. 18h. 59m. dec. 24. 29. S.
	—		Jupiter R. A. 9h. 8m. dec. 17. 26. N.
	—		Saturn R. A. 0h. 19m. dec. 0. 12. S.
18	—		Georg. R. A. 1h. 29m. dec. 8. 46. N.
	—		Mercury passes mer. 0h. 42m.
	—		Venus passes mer. 23h. 41m.
	—		Mars passes mer. 20h. 23m.
	—		Jupiter passes mer. 5h. 43m.
	—		Saturn passes mer. 20h. 52m.
	—		Georg. passes mer. 22h. 1m.
15	10	30	☽ in □ or last quarter
	—		Clock after the ☉ 3m. 55s.
	—		☽ rises 1h. 7m. M.
	—		☽ passes mer. 6h. 5m. M.
	—		☽ sets 11h. 9m. M.
	12		Vesta in conj. with the ☉
17	15	18	♂ in conj. with the ☽ diff. of dec. 0. 17. N.
18	0	5	♄ in conj. with the ☽ diff. of dec. 0. 3. N.
	18	29	☿ greatest hel. lat. N.
19	6	53	♅ in conj. with the ☽ diff. of dec. 3. 10. N.
20			Clock after the ☉ 3m. 46s.
	—		☽ rises 3h. 26m. M.
	—		☽ passes mer. 10h. 15m. M.
	—		☽ sets 5h. 18m. A.
	18	22	♀ in conj. with the ☽ diff. of dec. 6. 17. N.
21	8	59	♃'s first sat. will em.
22	6		☽ in Perigee
	7	37	Ecliptic conj. or ● new moon
23	4	40	☿ in conj. with the ☽ diff. of dec. 7. 8. N.
25			Clock after the ☉ 3m. 23s.
	—		☽ rises 7h. 20m. M.
	—		☽ passes mer. 3h. 17m. A.
	—		☽ sets 11h. 7m. A.
	11	8	♂ in conj. with ♄ diff. of dec. 0. 40. N.
26	11	35	♃'s third sat. will em.
	22	37	♃ in conj. with the ☽ diff. of dec. 2. 51. N.
27			♀ in the descending node
28	10	54	♃'s first sat. will em.
	11	23	☽ in □ or first quarter
29			Occul. 89 Leonis im. 12h. 8m. em. 13h. 6m.
30			Occul. 13 Virginis, im. 10h. em. 10h. 55m.
	—		Occul. *y* Virginis, im. 10h. 26m. em. 11h. 34m.
31			Pallas greatest hel. lat. N.

J. LEWTHWAITE, Rotherhithe.

THE

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OF

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CONJOINED SERIES.

No. CCX.

RECENT PATENTS.

To WILLIAM HOOD CLEMENT, *of the city of Philadelphia, in the United States of America, Gent., for an invention of certain improvements in the manufacture of sugar; part of which improvements is applicable to evaporation generally; also improved apparatus for preparing the cane-trash to be used as fuel,—being partly a communication.*—[Sealed 21st November, 1848.]

THE improvements in the manufacture of sugar, which form the principal part of this invention, have reference to the whole process of that manufacture, from the crushing of the sugar-cane to the crystallization and curing of the sugar. A part of the apparatus which the patentee employs in evaporating the syrup, he also proposes to apply to evaporation generally. And, lastly, the cane-trash, or refuse woody matter of the cane, is proposed to be prepared and rendered fit for use as a fuel.

These improvements are, for convenience, described under several heads, as follows:—The first head includes all the mechanical arrangements for the better manufacture of the sugar from the cane; which arrangements consist partly of improvements on an apparatus invented by the present patentee, and patented, as a communication from him, in the name of Alfred Vincent Newton, on the 23rd day of July, 1846, under the title of "certain improvements in the manufacture of sugar."* This head also includes those parts of the invention which apply to evaporation generally. The second

* For specification of this invention, see Vol. XXX., Conjoined Series, p. 85.

head embraces the improved apparatus for the preparation of the cane-trash or "bagass," to be used as a fuel. And, under the third and last head, certain new processes for the clarification of saccharine solutions are described.

The first improvement in the manufacture of sugar refers to the mill for crushing the cane. A diagram of this mill is shewn in Plate XIII., at fig. 1. The crushing-rollers, it will be perceived, are four in number. The cane first enters the mill between the rollers *c*, and *a*, and thence, passing between the rollers *c*, and *b*, comes out from the mill between the rollers *c*, and *d*, thus receiving three distinct bites or pressures. The two rollers *a*, and *b*, are made of equal but of somewhat less diameter than the two rollers *c*, and *d*, which are also of equal diameter. The rollers are placed in their frames or housings in such a position that the centre of the last roller *d*, shall be higher than that of the first roller *a*, and consequently more nearly on a horizontal line with the centre of the upper roller *c*. By this arrangement, the cane, after receiving the last pressure, is brought out from between the two rollers *c*, and *d*, nearly in a vertical position; in which position the juice runs more freely from the crushed cane, and is not so easily absorbed by its spongy texture. The surfaces of all the rollers are caused to travel at an equal speed by the usual arrangement of cog-wheels on their shafts. *e*, *e*, are stationary guides for directing the course of the cane from one bite of the rollers to the next succeeding bite. The juice is run directly from the mill on to a filtering apparatus, and thence passes to the evaporating apparatus; the peculiar construction of which, and the mode of working, will be understood from the following description thereof.

Fig. 2, represents, in horizontal plan view, the apparatus for filtering, clarifying, and evaporating the cane-juice; fig. 3, is a vertical section, taken longitudinally through the apparatus in the dotted line A, B, of fig. 2; fig. 4, is a transverse vertical section, taken in the dotted line C, D, of fig. 3; and fig. 5, is a similar view, taken in the line E, F, of the same figure. The juice is conducted on to the filter by a trough *g*, (see fig. 2,) which filter is composed of an endless surface of fine wire-cloth *m*, travelling over a pair of rollers *l*, *l*, mounted at the sides of a small receiver *k*, and under a drum *n*, which turns in bearings in the sides of a tank *h*, placed immediately under the receiver *k*, and containing water. The wire-cloth is caused to travel slowly in the direction of the arrow by means of a band, which passes over a pulley on the long horizontal shaft *i*, and under a pulley on the axle of the

drum *n*; motion being given to the shaft *i*, by a band from any first mover actuating the pulley *i**. As the juice from the mill flows on to the upper part of the wire-cloth *m*, it will percolate through and fall into the receiver *k*, while the feculent or refuse matters are carried forward by the cloth into the water-tank *h*. A small cylindrical brush *l**, which is shewn in section at fig. 3, is placed in bearings, fixed to the sides of the tank *h*, and a little below the surface of the water contained therein. The wire-cloth *m*, when set in motion, travels in contact with this brush, which is thereby caused to revolve and brush or wash off from the cloth the feculent or refuse matters. Another cylindrical brush *m**, (as will be seen in the figs. 3, and 4,) is placed on the opposite side of the tank *h*, above the water; it being fixed on a shaft, which revolves in bearings placed at the top of the sides of the tank. This shaft has a pulley keyed on to one end (see fig. 3,) which gives rotary motion to the brush, by a cord from a pulley on the shaft of the drum *n*. As this brush is caused to rotate in contact with the wire-cloth *m*, it brushes or wipes it free from the water it would otherwise carry up with it.

The patentee remarks, that some lime should be added to the water in the tank *h*; and, when charged with feculencies, the water should be run off to the still-house through the gutter *r**, (fig. 3,) and the tank refilled with fresh water. The filtered juice runs from the receiver *k*, into the heaters *e*, *e*, which have a double bottom to receive steam. This steam, which may be the exhaust steam from the engine on the works, is conducted under the false bottom of each heater by a pipe *s**, which is shewn at figs. 2, and 3. A pressure-valve *s*, (see fig. 2,) at the end of the pipe *s**, affords the means of regulating the temperature of the steam in the pipe, by loading it for that purpose. While one of these heaters is filling, the liquor is allowed to run from the other of these heaters through a ball-cock *x*, into the long narrow shallow boiler or evaporator *a*, which is divided into two parts by a partition *o**. About one-half of the bottom of the first division 1, of this evaporator, has a double bottom, as at *e**, and is heated by steam from the pipe *s**, after it has passed through the copper tubes *n**, in this division. The remainder of the bottom of the evaporator *a*, is heated by the naked fire in the flue *c*, of the furnace c^1. The object of this arrangement will presently be made apparent.

At about the centre of the division 1, of the evaporator *a*, is a small trough or receiver *o*, which, as will be seen by reference to fig. 3, does not reach to the bottom of the evapo-

rator, but has a pipe j, passing out of it through the side wall. The liquor in the division 1, of the evaporator, is kept, by the arrangement of the ball-cocks x, nearly on a level with the edge of this trough o. As liquids circulate in a direction from the hotter to the colder parts of an evaporator, the circulation will, in this case, be in the direction of the arrow, as the liquid over the flame in the flue c, is more heated than that over the steam in the double bottom e^*. The feculencies or scum that, by the effect of heat, rise to and on the surface of the liquor, are carried with the circulation in the direction of the arrow, and roll over the edge of the trough o, from whence they run through the pipe j, and along the canal p, and the gutter j^*, to the still-house. The condensed water of the heaters e, e, and of the double bottom e^*, runs into the condensed water-box m^1, (see fig. 3,) through small pipes, provided for that purpose. These pipes are furnished with cocks, which are opened just so much as to allow of the pressure put on the steam in the pipe s^*, as already stated, being properly maintained. The liquor meanwhile is running through a sluice-valve in the partition o^*, into the second division 2, of the evaporator, where, from the greater heat it receives, it would naturally tend to rise immediately into foam, and overflow the evaporator;—the evaporation of what remained would not however proceed in proportion to the fire surface; while the saccharine particles would be charred or decomposed by excess of heat. These results are due to the glutinous nature of saccharine solutions; for the steam generated in them by heat breaks with difficulty through the glutinous liquid, to rise to the surface and escape; while, in so doing, it carries up with it the liquid, forming a foam, and thus diminishes the density in an inverse proportion to the increase of volume. The evaporation of a saccharine liquid at the boiling point is in direct proportion to its density; and, if the density of the liquor in the division 2, of the evaporator, is allowed to diminish, all the injurious results just described would take place, and the shallow evaporator be worse than useless. To prevent the liquor rising in foam and diminishing its density, the inventor places, in the division 2, of the evaporator, a flat plate of iron x^1, pierced with holes from one end to the other, and fixed, at one end, by a hinge or other suitable fastening, to the partition o^*, in such a manner that it shall be horizontal, or nearly horizontal, in the liquor contained in the evaporator. To the other end of this plate a rigid rod m^2, (see fig. 3,) is attached, which is pendent from an excentric stud, fixed in a slot in a disc-wheel o^1, keyed to a horizontal

shaft p^1. This rod m^2, receives a vibratory motion through a band and the pulleys on the shaft *i*, and p^1, which cause the disc-wheel o^1, to revolve; and thus a regular vibratory motion is communicated to the plate x^1. A constant agitation of the liquor in the evaporator is thus produced, and the glutinous envelope of the steam-bubbles is thereby broken. The steam, when thus aided in freeing itself, does not carry up the liquor with it, or cause it to foam and overflow. A slight foaming on the surface of the liquor, which may be regulated by the length and the quickness of the stroke given to the agitator x^1, is permitted to take place, that a further clarification of the liquor may be proceeded with. This operation is effected by the paddle-wheel *q*, which, as it rotates, skims off the foam, and pushes it over the inclined flanch *r*, of the evaporator (see fig. 5,) into the trough or receiver p^*, from which it is raised by the pump *t*, into the division 1, of the evaporator, where its clarification proceeds with that of the liquor contained therein. That part of the liquor which is brushed off by the paddle-wheel consists principally of the vegetable albumen contained in the cane-juice, which, being partially coagulated by the heat, is beaten by the agitator into a foam, similar to that produced when the whites of eggs (an analogous substance in the animal organization) are beaten up. The now clarified liquor is run from the division 2, of the evaporator through the sluice-valve *u*, into a small concentrator *w*, where it is subjected to still greater heat, by the nearer proximity to the furnace c^1. In this concentrator an agitator *v*, may be used, exactly similar to the one already described, and worked in the same manner, as will be seen in the drawings; or the apparatus represented in vertical section at fig. 6, may be employed instead thereof. This agitator (which has also a vacuum effect) is thus composed:—*a*, is an inverted metal dish, fitting the open boiler *b*, within about an inch of its sides, and at about the same distance from the bottom of the boiler, when in its lowest position. Rising from a central opening of this dish is a vertical tube *c*, which is open to the atmosphere. *d, d*, are vertical guide-rods, which are attached to the dish *a*, and work through guides in a horizontal bar *e*, which is placed across, and bolted to the pan or boiler *b*. These rods are connected together at their upper ends, and are jointed to the rod *f*, through which an up-and-down motion can be communicated to the dish, by arrangements similar to those already described. At the up-stroke of the dish in the liquor contained in the boiler *b*, there will be a partial exhaustion in the liquid under the dish;

into which will be drawn the steam generating in the liquid by heat, and which will escape through the tube *c*. To further facilitate the escape of the steam from under the dish a partial vacuum is formed, by applying an intermittent jet of steam to the upper end of the tube *c*. For this purpose a small steam-pipe is connected with the boiler of the steam-engine on the sugar works, and provided with a cock, as at *g*; the handle for working which is connected with one of the guide-rods *d*, in such manner that it will be actuated by the upward and downward motion of the rod;—it being made to open the cock at the ascent and to shut it at the descent of the dish *a*. At the end of the steam-pipe a small jet-pipe is attached, which dips into the tube *c*, and has a return or bent-up end, as usual. When the steam issues out of this jet, which it will do at the ascent of the dish *a*, it will cause a partial vacuum in the upper part of the tube *c*, and the steam below the dish will rise to fill up that vacuum,—the vacated space under the dish being immediately filled by the steam generating in the liquid. When the steam-jet is not used, a light valve, opening outwards, may be placed at the upper extremity of the tube *c*.

The patentee here remarks, that those parts of his improvements which apply to evaporation generally are, the agitator, shewn at x^1, (figs. 2, and 3,) and that just described with reference to fig. 6: thus an agitator, similar to x^1, may be placed in the upper division of the steam-boiler, shewn in longitudinal and transverse section at figs. 7, and 8.

When applied to steam-generators, the actuating rod of the agitator must work through a stuffing-box in the upper part of the boiler. The agitator *a*, may be also used in a still. In thus applying it, the upper part of the still is to be closed to the atmosphere, as usual;—the tube *c*, without the steam-jet, is made to work through a stuffing-box in the covering of the still, and also through a stuffing-box in the neck of the worm, and thus form also the guide for the inverted dish. The agitators, in both of these cases, will be found to accelerate the evaporation.

To return to the process of manufacturing sugar. The liquor in the pan *w*, having been concentrated to a syrup, is baled into the tilt-pan *y*, where it undergoes a still further concentration, until it reaches that degree which is technically termed the "striking point." The pan is then lifted on its axis, to throw the charge of liquid sugar into a trough *y**, from whence it runs into the crystallizing and curing cases, hereafter to be described.

The steam-boiler, which generates the steam for the uses of the sugar mills, is so constructed and arranged, with regard to the evaporators for boiling the sugar, that the flames generated in the furnace c^1, after having passed under the sugar-evaporators, are made to heat the steam-boiler. The connection of the evaporators with the boiler is shewn at figs. 2, and 3. The flames are conducted into a flue under the upper cylindrical steam boiler A, figs. 7, and 8, which is placed directly over another cylindrical boiler B, and connected therewith by the tubes a^1, a^1, a^1. The flames are then carried downwards, in the direction of the arrow, all around the lower boiler B, and also through an excentric cylindrical flue in this boiler (as shewn by the arrows) until they reach the chimney shaft. The lower boiler B, which rests on the cross walls *b*, *b*, *b*, is thus plunged entirely in the fire, and becomes a reservoir of highly heated water, which rises to the upper boiler as the water therein is consumed, and, as the supply-water is forced into the boiler B, through the feed-pipe *c*. A great fire-surface being obtained by this arrangement of double boiler, sufficient steam is generated by the flames that proceed from the furnace c^1, after they have passed under the sugar evaporators, to furnish power to grind the cane, and for other purposes, already and hereafter to be described: the furnace h^*, shewn at fig. 3, and the flue c^*, shewn by dotted lines at fig. 2, are merely used at starting, to get up steam for grinding sufficient cane to fill the evaporators with juice. When this operation is performed, the furnace h^*, is closed, and the furnace c^1, is alone used. The liquid sugar thrown out of the tilt-pan *y*, into the trough y^*, runs directly into the crystallizing and curing cases,—one of which is shewn in longitudinal section at fig. 9, and in cross section at fig. 10. This case consists of a rectangular box, mounted on wheels, and divided horizontally into two compartments *a*, and *b*, (the upper one of which is open) by means of two plates of iron *c*, *c*, which incline downwards, towards the middle of the box, and are attached to the sides and ends thereof. The plates *c*, *c*, are of such size, that when fixed, as described, a narrow longitudinal opening is left between them from end to end of the box. This opening is closed by a spring-bar, which somewhat exceeds the opening in width, and is capable of being brought close up to the under face of the plates *c*, *c*, but has a natural tendency to take the form of the dotted line in fig. 9. The ends of the bar are bent upwards and turned over the edges of the box, so that a wedge, applied between the turned over part and the edge of each end of the box, will draw the

lower or horizontal part of the spring-bar into close contact with the under sides of the plates *c, c,* and thus close up the opening between them. This being done, the liquid sugar from the tilt-pan is received in the upper compartment *a,* of the box; and when it has remained a sufficient time to crystallize, the wedges which hold up the spring-bar are displaced, and the bar falls or takes its natural curve. The longitudinal opening is thus left free, and the molasses or liquid parts, contained in the sugar, drain into the lower compartment of the box. To facilitate this separation of the molasses from the crystallized particles of the sugar, a jet of steam is introduced into the lower compartment *b,* by means of a cock and pipe *d,* in the side of the box; the air and molasses contained in the lower compartment being previously let out by a cock *e.* As the molasses or liquid parts of the sugar fall, the steam will be condensed, and thus give the molasses an increased tendency to flow down to fill up the vacuum created in the compartment *b.* The injection of steam is to be repeated, from time to time, until the sugar is completely cured; when the cases may be run out into the sun, or into an oven, to dry the sugar, before packing it into casks or bags.

The second head of the invention consists, as before stated, in improved apparatus for preparing the cane-trash or bagass, to be used as a fuel. The mode of proceeding in the preparation is as follows:—The bagass is taken from the mill and spread over the open space which generally surrounds the sugar works; the improved apparatus or machine is then employed for tossing the cane-trash into the air, that it may the more speedily be dried without undergoing fermentation, to the destruction of the saccharine matter, which is the most combustible part of the bagass. The same machine also serves to gather up the bagass, and convey it to the furnace to be consumed.

This machine consists of a cart-body, supported by a pair of running wheels, which turn on a bent axle, that passes under the machine. In the bottom of the cart-body a trap-door is made, for the purpose of discharging the load of bagass; and on the hub of one of the wheels is secured a pulley, which, by a strong cord or chain, can give rotary motion to a smaller pulley, keyed on to a shaft or axis which revolves in bearings at the upper part of the cart-body. On this shaft one of a pair of cylinders, extending the whole width of the cart-body, is fixed, for the purpose of supporting and rotating two endless chains: the second cylinder revolves in bearings at the lower part of the back of the cart-body.

These endless chains carry a series of horizontal bars of iron, armed with slightly curved hooks or tines, as at *e*, which, as the machine is drawn forward, are caused to travel upwards, by rotary motion being given to the top cylinder through the cord and the pulleys before mentioned. The hooks or tines, when thus actuated, collect the bagass spread out on the ground, and carry it up an inclined plane, forming the tail of the cart. When the machine is required to toss the bagass or cane-trash into the air, and distribute it over the ground, a tail-board, which is capable of sliding in grooves in the sides of the machine, is made to close the cart: the cane-trash or bagass will then be taken up by the tines and thrown into the air, and, in falling upon the ground, a different surface of the bagass will be presented to the action of the air and the sun's rays. When the bagass is sufficiently dry, the machine is drawn over the ground (the tail-board being raised); and the tines being set in action, the cart-body is quickly filled. The dry bagass is then carried to the furnace, and is ready to be used as a fuel.

The third and last head of this invention comprises several processes of clarification. The first of these is principally applicable to saccharine solutions of little specific gravity, such as the native juices of the cane and the beet-root. These juices contain large quantities of vegetable albumen, which substance does not completely coagulate at the boiling point of these liquids in the open air, but requires a considerably higher temperature to be thus affected. This higher temperature the juices heated in the open air cannot attain until their density has been increased by the evaporation of the aqueous particles; but when this takes place, the vegetable albumen, although coagulated, cannot be completely separated from the saccharine solution. This arises from the glutinous nature of the liquids, which is necessarily increased as the density increases, rendering it more and more difficult to separate from them any foreign substance they may contain. To coagulate completely the vegetable albumen contained in a saccharine solution, without at the same time increasing the density, the solution is placed in a close vessel or clarifier, provided with a safety-valve and a thermometer. In this vessel the solution is heated by steam or otherwise; the safety-valve being loaded, so as to prevent the escape of the steam or vapor from the liquid in the vessel until the thermometer indicates as high a temperature in the liquid as it will bear, without injury to the saccharine particles. The vegetable albumen being thus completely coagulated, without

the density of the liquid having been increased, it may be easily separated, either by filtration, or by the more common process of scumming. The patentee remarks, that the lime used to aid the clarification may be added to the liquor either before or after it is submitted to this process (which he terms "a high-pressure clarification"), as the manufacturer may find most advantageous. The patentee prefaces the description of his second process of clarification by the following remarks:—It is well known that many of the metallic oxides have affinities for the organic impurities contained in saccharine solutions, and that they will combine with and precipitate them. It is also known that these oxides combine more readily with the impurities when they are presented to them in a nascent state from their salts or compounds. In some of these compounds the base or the oxide has so weak an affinity for the acid that it is simply sufficient to dissolve the salt in the saccharine solution,—when it decomposes, and the oxide is presented in a nascent state to the impurities. With other salts this decomposition does not so easily take place. In such cases it has been found necessary to add an alkali or alkaline earth, which, by combining with the acid of the salt, will set free the oxide or base. There are objections to this application of an alkali or alkaline earth to saccharine solutions; for, on account of the specific gravity of such solutions, and the chemical affinity of the saccharine particles for the alkali, it requires to be used in excess, and the alkali combines with the sugar, either directly, or forms with it a triple compound of sugar, alkali, and the oxide employed: either of these results would be injurious to the production of sugar.

To present the base of a salt in a nascent state to the impurities of a saccharine solution, without the aid of an alkali or alkaline earth, or without using an excess of the alkali, the patentee avails himself of the agency of electricity, preferring to employ it in that form known as galvanic. The saccharine solution is placed in a suitable vessel, open to the air, and in which it may be heated—such as a wooden box, provided with steam-pipes. Having dissolved in the solution the salt to be used in the clarification, the negative end or pole of a galvanic battery is connected, by a wire or other suitable conductor, to a platinum plate, enclosed in a porous vessel or bag, open at top, and filled with water, or with water containing in solution some of the salt that has been dissolved in the saccharine liquid. This porous vessel is immersed in the solution to be clarified; and the positive pole or end of the galvanic battery is connected with a plate of metal, which is also placed in the

solution, opposite to, and at a short distance from, the porous vessel. This plate of metal thus becomes the negative end or electrode of the galvanic circuit,—the porous vessel or bag containing the positive electrode. The galvanic battery being in action, a current of electricity circulates through the saccharine solution, decomposing the salt dissolved therein, the base of which proceeds to the negative electrode, and combines there with the impurities. This combination is much promoted by heating the solution; as the intensity of the electrical action is thereby increased; and, at the same time, the liquid is caused to circulate, and bring all parts of it successively in contact with the negative electrode. The acid of the salt proceeds to the positive electrode in the porous vessel, from which it may be drawn off, or the porous vessel may be lifted out of the solution and the acid emptied out of it. When the salt used in the clarification contains an oxide, which is reduced by secondary action at the negative electrode, this electrode is enclosed in a porous vessel, filled with water; and care must be taken, in all cases, that the electrodes do not come in contact with the tubes for heating the solution. A series of electrodes may be placed in the solution, at short distances apart; a positive being connected with a negative, and the two extreme electrodes unconnected with the others, but connected with the poles of the galvanic battery. A saccharine solution, clarified by a metallic oxide, either in the manner described, or in any other manner, may contain some of the salt, or part of the oxide of the salt that has been used, in combination with its saccharine particles, and which it will be necessary to separate from them. To effect this separation, electricity is still employed, after the precipitated impurities are removed by the usual means.

To render the application of electricity more economical, the patentee first adds to the solution a decomposing agent, which, by combining chemically with the greater part of the oxide, will leave a less quantity to be separated by the electricity. The phosphates of lime and of soda, and the sulphuret of calcium, are good decomposing agents; and, among the first mentioned of these, granulated phosphate of lime (which may be produced by burning to whiteness granulated animal charcoal, that is no longer suitable for decolorizing) may be used in the following manner:—A filter, similar to the animal charcoal filter now used for decolorizing, is formed, by placing a bed of the granulated phosphate in a box or case; and in this bed a porous vessel, open at top, is placed. This vessel is filled with water, slightly acidulated with sulphuric

acid, and in it a plate of zinc or of iron is immersed, to form the positive element of a galvanic pair. Then, by means of a wire, the positive element is connected with a plate of a negative metal, which is imbedded in the phosphate opposite to the positive element. In this way one or more series of galvanic pairs is formed in the filter; the saccharine solution containing the oxide is then allowed to run through the filter, when the following results will be found to have taken place:—The current of electricity, which is generated by the galvanic pairs, circulates through the saccharine solution, which is in contact with the phosphate of lime, and causes a deposition, on the negative plate, of the metal of part of the oxide or salt which was in combination with the sugar; while the remainder of the oxide combines with the phosphoric acid of the phosphate, which is set free partly by the electric action, partly by any free acid contained in the saccharine solution (and which acid may be a result of the process of clarification) combining with the base of the phosphate, and also by the acid, which (by exosmic action) passes through the porous vessel or vessels, combining with this base. Thus an insoluble phosphate of the metallic oxide is formed, which remains in the filter; while the saccharine solution comes from it free from the oxide.

It may now be desirable to pass this clarified solution through an animal charcoal-filter, to complete its clarification and decolorization. This further clarification the patentee effects by the following process, which is also applicable to saccharine solutions clarified by any other process:—The granulated animal charcoal being contained, as usual, in a case or vessel of metal (which should be insulated), this case is connected, by a wire, with the positive pole of a galvanic battery; in the centre of the body of the charcoal a porous vessel, filled with water, or with slightly acidulated water, is imbedded; and in this vessel a plate of metal (platinum, by preference), connected with the negative end or pole of the galvanic battery, is placed, to form the positive electrode. By this arrangement, a current of electricity is circulated through the saccharine solution in contact with the charcoal, which will be found to promote the different combinations that take place between the animal charcoal and those partially clarified saccharine solutions that may be placed in contact with it.

The patentee claims, Firstly,—the arrangement of the crushing-rollers of the mill, as shewn in the drawings, for the purpose above described. Secondly,—the application of the

brushes to the filtering apparatus. Thirdly,—the improved arrangements for heating and scumming the liquor in the first division 1, of the evaporator *a*. Fourthly,—the several means, hereinbefore described, for agitating liquids, and effecting their more rapid evaporation; and, in the case of saccharine solutions, for preventing them from being injuriously affected by heat. Fifthly,—the arrangement of the steam-boilers in connection with the evaporators, as shewn in the drawings. Sixthly,—the peculiar construction of double-chamber crystallizing and curing cases, or any mere modification thereof. Seventhly,—the apparatus, above described, for preparing the cane-trash to be used as fuel. Eighthly,—the process of clarification, termed by the patentee—the high-pressure clarification. Ninthly,—the precipitating of the impurities contained in saccharine solutions, by causing the base of a salt, or an "ion" of a chemical compound, to combine with the impurities in the solution, through the instrumentality of electricity, as above described. Tenthly,—the use or application of electricity to separate from combination with the sugar of a saccharine solution, and to precipitate, any salt or oxide which results from the process of clarification. And, Lastly,—the circulating of a current of electricity through a bed of charcoal, to promote the different combinations which take place when a partially-clarified saccharine solution is in contact with the charcoal.—[*Inrolled May*, 1849.]

To Orlando Brothers, *of Blackburn, in the county of Lancaster, civil engineer, for his invention of certain improvements in the method of manufacturing retorts, and in the machinery or apparatus connected therewith.*—[Sealed 19th August, 1847.]

This invention applies more particularly to retorts to be employed in the manufacture of gas for illumination; and consists in an improved method of manufacturing such retorts from plastic substances, by the employment of a contracting core or mould (composed of inclined planes or wedges) and other apparatus connected therewith, as hereafter described, and so arranged that, as such plastic substances contract in drying, the solid core or mould can be made to contract also, and, consequently, prevent such retorts from cracking or becoming distorted whilst drying, previous to their being placed in the kiln.

In Plate XIV., fig. 1, is a front view of the retort-frame

and contracting solid mould or core; fig. 2, is a side elevation; and fig. 3, a plan view of the same: figs. 4, and 5, represent the two ends of the contracting core. The apparatus shewn in the drawings is intended for forming retorts about eight feet long, sixteen inches wide, thirteen and a half inches high, and three inches thick. A, A, is a loose frame of cast-iron, with a flange *a*, at the bottom, by which it is screwed to the bottom plate *b*, *b*. The D-shaped opening in this frame is made the size of the contracting solid mould B, B; and the breadth of the D-shaped part of this frame is three inches, or thereabouts: the projection of the flange at *c*, *c*, is for the flange of the side frame E, E, (see fig. 2,) to be bolted to. The depth of the frame at *d*, (fig. 1,) is about three inches; so that, when the centre of the said mould is in a line with the centre of the frame, there will be left a space of three inches, or thereabouts, all round the aforesaid mould, for the reception of the plastic substance to form the retort. The loose frame A, A, the sides E, E, E, and the end plate H, rest upon the bottom plate *b*, *b*. *f*, *f*, *f*, are laths of wood (or bars of metal will answer), about one inch thick, and so arranged as to fit the segments of a circle; and *g*, *g*, are two sickle-shaped pieces of wrought-iron, bolted to the frame A, A,—the distance between the front frame and the said sickle-shaped pieces *g*, being such as to allow the laths *f*, *f*, *f*, to slip in between them and the frame A. *h*, *h*, are iron wheels, by which the retort and frame can be more easily moved. By referring to fig. 4, which is a front view of the mould or core, it will be seen that the core consists of nine pieces. These pieces are all wedge-shaped, as will be understood by comparing the size of their ends at fig. 4, with their opposite ends, as shewn at fig. 5: the centre piece has two rabbits affixed to it, to keep the entire core together. The manner in which the core is withdrawn, after the retort is formed, is shewn at figs. 6, 7, 8, and 9. Fig. 6, shews the first part of the core or mould, designated No. 1, drawn out from its place; fig. 7, shews the second part, Nos. 2, and 3, of the core or mould removed; fig. 8, shews the third part of the core or mould, Nos. 4, and 5, withdrawn; and fig. 9, shews the fourth part of the core or mould, No. 6, drawn out: the remaining parts of the core or mould, 7, 8, and 9, are next successively withdrawn.

Fig. 10, is a plan of the contracting apparatus;—it is composed of four bars of wrought-iron, connected together by nuts and screws, which admit of the apparatus being tightened either endways or longitudinally. This iron framing

embraces four strong pieces of wood, which are placed against the ends and sides of the retorts, and are capable of being pressed inwards by the action of the contracting apparatus. When the bottom and sides of the retort are sufficiently dry to be stripped of the frame and mould, this contracting apparatus is put on, and remains for about fifty hours,—it being, during that time, gradually tightened by means of the nuts, both endways and longitudinally. By this means, the bottom of the plastic substance, of which the retort is composed, is prevented from cracking while contracting in drying, as the tenacity with which the clay adheres to the bottom of the frame upon which it is placed is thereby overcome.

The process of manufacturing retorts from plastic substances is carried on in the following manner:—In the first instance the cast-iron frames are bolted together, and the sides inside are lined with slabs of planed wood, oiled, to prevent the plastic substance from adhering to the frames. The pieces of the plastic substance used, having been previously well tempered and made into balls, of about six or eight inches in diameter, are taken by the operator and thrown (beginning at either end of the frame) with tolerable force upon the bottom of the frame. As he goes along towards the opposite end, he kneads these balls well together, until the thickness of the substance used is as thick as the depth of the frame A, A, under the core or mould B, B, B, fig. 1. The surface of the plastic substance is then worked level, and of uniform thickness, by a straight-edge. The core or mould is now put together and laid upon the bottom of the plastic substance, and placed within the frame, as shewn at figs. 1, 2, and 3, but without the apparatus *f, f,* and *g, g.* At one side of the core two pieces of wood, about six inches long and three inches thick, are placed; also one at the end of the core or mould; so as to keep the core steady whilst the plastic substance is worked in on the opposite side of the core. When the plastic substance is level with the top of the frame, the pieces of wood are removed, and the opposite side and end are in turn filled with the plastic substance,—care being taken to work it well in. The next proceeding is to work the plastic substance on the top of the core or mould until the thickness is equal to *d, d,* fig. 1. After this, a straight-edge is placed upon the curved part of the front-plate A, A, and end-plate H, H, fig. 2, and worked right and left, and *vice versâ*; whereby the plastic substance is made of equal thickness and with a smooth exterior. In this state the retort is allowed to remain in a drying shed (artificially heated by flues or otherwise to about

90° Fahr.) for about twenty-four hours; after which the different parts of the contracting solid core or mould are gradually drawn out, so as to allow of the contraction of the retort. The time required for the final withdrawal of the different parts of the core will entirely depend upon the state of the plastic substance used, and the size of the retort made. If the clay be well tempered, a retort eight feet long, sixteen inches wide, and thirteen and a half inches high, placed in a drying shed, heated to about 95° Fahr., may have the core entirely withdrawn in about sixty hours from the time it was first made. The laths *f, f, f,* and the sickle-shaped pieces of iron, before described, should then be put on, and remain on for at least twenty-four hours longer. After that time has expired, the whole of the apparatus should be stripped off the retort, and the contracting apparatus be put on, and gradually screwed up, both endways and lengthways, during the space of thirty-six hours longer; at the expiration of which time, the contracting apparatus may be removed; but the retort is allowed to remain in the drying shed until quite dry. The drying shed should be kept at an uniform heat of 90° Fahr., during the whole period: a retort of the size before-named will then be sufficiently dry and ready for burning in about fourteen days.

The patentee claims the manufacturing of retorts from plastic substances by the employment of a contracting solid core or mould, composed of inclined planes or wedges, and the other apparatus connected therewith, as above described. [*Inrolled February,* 1848.]

To Bartholomew Beniowski, *of Bow-street, Covent Garden, in the county of Middlesex, Major in the late Polish Army, for certain improvements in the apparatus for and process of printing.*—[Sealed 14th October, 1847.]

This invention consists, firstly, in various improvements upon an invention for which the present patentee obtained letters patent on the 17th November, 1846,* and also in the means of carrying the same into more effective operation. In the following description the former specification will occasionally be referred to, in order to point out and explain more clearly the present improvements.

This invention consists, secondly, in a new or improved machine for letter-press printing, which is constructed upon

* For description of this invention see Vol. XXXI., p. 166, Conjoined Series.

the continuous rotary principle; the type being secured to the internal or concave surface of a large cylinder, and made to pass, in alternate succession, in contact, first with suitable inking-rollers, and then with conveniently arranged impression cylinders.

The first head of the present invention, or that which relates to the improvements of 1846, consists, firstly, in an improved mode of marking the types on their sides with letters or signs, to shew, without examining the face, the nature of each type, and to facilitate the distribution of the letters. In his former specification the patentee proposed to mark, by stamping, engraving, or writing, on the sides of the type, the letter which the type is intended to print; but, instead of such letters on the sides being reversed, like the letter which forms the face of the type, they were made to read in the ordinary way of printed letters. Now the object of the present improvements is to mark the type in a more durable and economical manner than by the former plan. This is effected in either of the following ways:—First, by casting the requisite letters or marks, not only on the sides or body of the type, but on the lower end thereof, in intaglio, at the same time that the type is made; so that when the type is removed from the mould it will be found to present, not only the proper letter in relief on its face, but also the same letter in intaglio at its lower end, and on its sides, but not reversed. To facilitate this operation the patentee has made some minor alterations in, and additions to, the ordinary type-founders' moulds, as will be seen by referring to Plate XIV. Fig. 1, is a longitudinal vertical section, taken through the mould, in the line 1, 2, of fig. 2, which represents a horizontal section of the same, taken in the line 3, 4, of fig. 1; and fig. 3, is a transverse vertical section, taken in the line 5, 6, of fig. 1. Instead of the mouth of the mould being, as usual, above the foot of the type, it is on the upper side of what is technically called the body of the mould. *a, a,* is the mouth, which, through the groove or channel *b*, communicates with the space *c*, in which the shank of the type is cast, as usual; and *d, d,* are registers on the upper end of the mould,—their construction being exactly like that of the usual registers *d**, *d**, on the lower end of the mould. The office of these upper registers is to receive a metal piece *e*, having a raised letter made thereon (as shewn in the detached view, figs. 4,), which is intended to produce, by casting, a sunk letter at the lower end of the type. Square holes are made through the carriage of each half of the mould; and similar square holes are made through the body of each half of the

mould. Into each of these four holes a rod of brass or iron *f, f,* fits tightly; and on the inner end of each of these rods is a letter, very slightly in relief, and similar to that on the face of the type: the other end of each of these rods is threaded, and carries a female thumb-screw *g*. By means of these thumb-screws the rods are adjusted, so that the letter on its other end shall not protrude beyond the hole more than about one-hundredth of an inch; but this protruding of the letters will naturally produce, in casting, an intaglio letter on each side of the shank of the type. The operation of casting and dressing the type is conducted in the usual way, except that after the metal is poured into the mould, the upper die *e*, as well as the lower one, is removed before the two halves of the mould are separated for taking out the type.

The "jet" or superfluous metal not being, as usual, on the foot of the type, the mode of planing off the break must consequently be conducted in a somewhat different manner. This is effected by arranging the types horizontally, with the breaks upwards, and then planing them off with a plane, the stock of which is suitably shaped for this purpose.

Another means proposed of marking the types on their sides with the proper letters, for the purpose already explained, is by the employment of the electrotype process, whereby the signs or letters may be rendered more visible on the shank of the type,—the said letters having been first made thereon in intaglio, either by casting, stamping, engraving, or in any other suitable manner.

In the specification of his former patent the patentee proposed to coat the types with varnish, in order to prevent them from acting, through the touch, injuriously on the health of the compositor; but, as a more effectual plan, he prefers to cover the types with a coating of any suitable metal, by means of the electrotype process.

The second improvement under the present head consists in employing, for letter-press printing (besides the usual sorts), types which are cast together with a space at their side, as shewn in fig. 5. These types are used at the end of words, or in other places where they may be required, such as at the end of a series of figures; the object being to save a portion of the usual labor of composing and distributing; and also to allow of the types being put into the composing-stick vertically, with the faces downwards, and the sunk letters upwards, and set up or composed from left to right, in the way in which letter-press printing is read.

The casting of intaglio letters at the lower end of type

admits of stereotype castings, sometimes termed "polytypes," being readily obtained therefrom. Thus, from one end, where the usual letter is situate, printed impressions may be taken; while from the end containing the sunk letter a polytype may be obtained, either by pressing into it gutta-percha or any other suitable material, or (as the patentee prefers) by pouring upon it molten metal, after the manner of the stereotype process. One difficulty remains, viz., for printing—the spaces must be of less height than the types; therefore, when, for the purpose of facilitating composition and polytyping, the types, with the sunk letters, are placed upwards, these spaces would slip down, and, consequently, spoil the object of polytyping; but, by casting the spaces with the final letters, all this is evidently remedied. These final letters may be distributed into one and the same compartment with the usual letters;—the compositor will easily distinguish them by their size and shape from the corresponding usual letters, of which the words, &c., are composed; and therefore the "case" will be no more complicated than it is at present.

Another improvement upon the former invention relates to what the patentee denominated the "authoriton." Instead of making the front ends of the tubes of this authoriton open, he closes them up, as shewn at fig. 6,—an aperture being, however, left in the top side, so as to allow of the types being taken out, as required. By this means, a more ready supply of type can be obtained; as the authoriton may be set at any convenient inclination, without any danger of the types falling out; and they will slide down the tubes by their own gravity, and thus come opposite the opening; from which they may be taken as long as any remain in the tubes.

The former patent included a method of distributing type, and arranging the letters in a series of rectangular tubes, connected together, and denominated the "store;" the types were to be placed on a table, and a boy was to pick out the letters, and place them in their proper tubes;—an operation that was considerably facilitated by the shank of each type being marked with its corresponding letter. To still further facilitate this sorting or distributing operation, the store is placed in a box, furnished at its side with a ledge or small table, upon which a small heap of the types intended to be distributed is placed. This table serves also to support a small dish or shallow saucer, attached to the upper end of a rod, which passes through a hole in the table. In sorting the types, the boy places a few in the dish or saucer; and, by taking only a few at a time, he can quickly sort them, and

place them in their proper tubes: the rod, to which the saucer is attached, he holds in his left hand, and can thereby readily turn round the type contained in the dish, in order to recognize the different letters.

The second part of the invention refers to a novel arrangement or construction of machinery for letter-press printing. The principal feature of novelty consists in securing the type or blocks to the inner or concave surface of a cylinder, in place of the outer circumference, as has hitherto been done. By this arrangement, the centrifugal force, developed during the rapid rotation of the large cylinder, has the effect of retaining the types in their proper places, rather than of deranging them, as is the case in cylindrical printing generally.

Fig. 7, represents the improved cylinder printing machine, in longitudinal vertical section; and fig. 8, is a transverse vertical section of the same. The machine consists principally of a large working cylinder *a, a, a,* shewn detached, in partial elevation, at figs. 7*. On the inner or concave surface of this cylinder the form of types is secured by screw-bolts, or in any other convenient manner.

This large cylinder is furnished, on its periphery, nearly equidistant from its ends, with a ring of teeth *b, b, b,* which gears into and is driven by a toothed wheel *d, d,* on the main driving-shaft *e*: this shaft is mounted in suitable bearings attached to the framing *c, c.* Any convenient number of printing or impression-cylinders *f, f, f,* dependent, of course, upon the internal capacity of the large cylinder, are placed therein, but run in bearings attached to the framing *c, c, c.* These impression-cylinders *f, f,* severally carry, at one of their ends, a toothed-wheel *g,* in gear with a circular rack *h, h, h,* made on the inner or concave side of the large cylinder, and extending all round the same, as shewn at fig. 7. As the printing or impression-cylinders *f, f,* are placed inside the large cylinder *a, a, a,* but have their bearing outside the same; and as the inking-rollers *i, i, i,* and the delivering and receiving or feed-tables, *j, j, j, r, r, r,* and other parts of the machinery are situated within the large cylinder—it will be obvious that the latter must be driven from the outside, and must not be permanently attached to anything inside: it is, therefore, supported by two pairs of rings *k, k,* furnished with suitable antifriction rollers *k**, *k**, *k**, which run on a pair of wide circular rails *l, l, l,* attached to the framing. The large cylinder is prevented from moving laterally out of its place, when rotating, by two ribs *m, m,* which are cast on its outer surface, and bear against the inner edges of the antifriction

rollers *k, k,* as the cylinder rotates, as shewn at fig. 8. The form of type is, as before-mentioned, secured in any suitable and convenient manner to the inner surface of the cylinder, and the remaining portion of the concave surface of the cylinder is employed as a table for distributing the ink, and supplying the inking-rollers *i, i,* therewith: these latter are mounted in suitable bearings, attached to the framing, as shewn, and are kept in contact with the distributing table by means of coiled springs, which bear on their axles, and always press them outwards. The inking apparatus consists, as usual, of a fountain or trough *n,* containing a quantity of ink, which is gradually supplied to the machine by a ductor-roller *n**, that is made to rotate slowly by means of bands and pulleys *p**, *p**, *p**, connected and in communication with the main shaft of the machine. From the ductor-roller *n**, the ink is taken by a second or vibrating-roller *o,* mounted at one end of an arm or lever, and worked by cam-pieces *q, q,* secured to the large cylinder, near the place where the form of type is secured. The cam-pieces *q, q,* also serve to raise up the inking-rollers *i, i, i,* and the distributing-rollers *i**, *i**, as the form of type comes round, and thereby ink the surface of the types, as will be hereafter more fully explained. *r, r, r,* are boards or tables containing the paper, which is fed into the machines, sheet by sheet, by boys; and *j, j, j,* are other boards, for delivering the printed sheets as they issue from the machine. Near each impression-cylinder a bell-crank vibrating-lever *t, t, t,* furnished with a "drop-down bar" *t**, or small rollers at each end, is mounted, for the purpose of laying hold of the blank sheet of paper, and carrying it into the machine. These levers *t, t, t,* are also worked by the cam-pieces *q, q,* as will be hereafter explained.

It will be understood by every practical printer that, in order to distribute the ink in a proper manner on the cylindrical distributing-table, it will be necessary to give the distributing rollers *i**, *i**, an alternate horizontal motion in the direction of their axes, as well as a rotary motion. This is effected in the following manner:—Upon referring to the detached view, fig. 9, (which represents a portion of the internal surface of the large cylinder *a,* laid out flat, with the form of type, and some other parts of the machine in connection therewith) it will be seen that the axles of the distributing-rollers *i**, *i**, are furnished at each end with friction-pulleys *u, u,* having conical faces, and that the edges of the large cylinder, instead of being straight or even, are waved or made with curves, in the form of a cam, all round, except that part where

acid, and in it a plate of zinc or of iron is immersed, to form the positive element of a galvanic pair. Then, by means of a wire, the positive element is connected with a plate of a negative metal, which is imbedded in the phosphate opposite to the positive element. In this way one or more series of galvanic pairs is formed in the filter; the saccharine solution containing the oxide is then allowed to run through the filter, when the following results will be found to have taken place:—The current of electricity, which is generated by the galvanic pairs, circulates through the saccharine solution, which is in contact with the phosphate of lime, and causes a deposition, on the negative plate, of the metal of part of the oxide or salt which was in combination with the sugar; while the remainder of the oxide combines with the phosphoric acid of the phosphate, which is set free partly by the electric action, partly by any free acid contained in the saccharine solution (and which acid may be a result of the process of clarification) combining with the base of the phosphate, and also by the acid, which (by exosmic action) passes through the porous vessel or vessels, combining with this base. Thus an insoluble phosphate of the metallic oxide is formed, which remains in the filter; while the saccharine solution comes from it free from the oxide.

It may now be desirable to pass this clarified solution through an animal charcoal-filter, to complete its clarification and decolorization. This further clarification the patentee effects by the following process, which is also applicable to saccharine solutions clarified by any other process:—The granulated animal charcoal being contained, as usual, in a case or vessel of metal (which should be insulated), this case is connected, by a wire, with the positive pole of a galvanic battery; in the centre of the body of the charcoal a porous vessel, filled with water, or with slightly acidulated water, is imbedded; and in this vessel a plate of metal (platinum, by preference), connected with the negative end or pole of the galvanic battery, is placed, to form the positive electrode. By this arrangement, a current of electricity is circulated through the saccharine solution in contact with the charcoal, which will be found to promote the different combinations that take place between the animal charcoal and those partially clarified saccharine solutions that may be placed in contact with it.

The patentee claims, Firstly,—the arrangement of the crushing-rollers of the mill, as shewn in the drawings, for the purpose above described. Secondly,—the application of the

brushes to the filtering apparatus. Thirdly,—the improved arrangements for heating and scumming the liquor in the first division 1, of the evaporator *a*. Fourthly,—the several means, hereinbefore described, for agitating liquids, and effecting their more rapid evaporation; and, in the case of saccharine solutions, for preventing them from being injuriously affected by heat. Fifthly,—the arrangement of the steam-boilers in connection with the evaporators, as shewn in the drawings. Sixthly,—the peculiar construction of double-chamber crystallizing and curing cases, or any mere modification thereof. Seventhly,—the apparatus, above described, for preparing the cane-trash to be used as fuel. Eighthly,—the process of clarification, termed by the patentee—the high-pressure clarification. Ninthly,—the precipitating of the impurities contained in saccharine solutions, by causing the base of a salt, or an "ion" of a chemical compound, to combine with the impurities in the solution, through the instrumentality of electricity, as above described. Tenthly,—the use or application of electricity to separate from combination with the sugar of a saccharine solution, and to precipitate, any salt or oxide which results from the process of clarification. And, Lastly,—the circulating of a current of electricity through a bed of charcoal, to promote the different combinations which take place when a partially-clarified saccharine solution is in contact with the charcoal.—[*Inrolled May*, 1849.]

To Orlando Brothers, *of Blackburn, in the county of Lancaster, civil engineer, for his invention of certain improvements in the method of manufacturing retorts, and in the machinery or apparatus connected therewith.*—[Sealed 19th August, 1847.]

This invention applies more particularly to retorts to be employed in the manufacture of gas for illumination; and consists in an improved method of manufacturing such retorts from plastic substances, by the employment of a contracting core or mould (composed of inclined planes or wedges) and other apparatus connected therewith, as hereafter described, and so arranged that, as such plastic substances contract in drying, the solid core or mould can be made to contract also, and, consequently, prevent such retorts from cracking or becoming distorted whilst drying, previous to their being placed in the kiln.

In Plate XIV., fig. 1, is a front view of the retort-frame

To JOHN WRIGHT, *of Camberwell, in the county of Surrey, engineer, for improvements in generating steam and evaporating fluids.*—[Sealed 12th October, 1848.]

THIS invention relates to the construction and application of tubes and a particular kind of cellular vessel, charged with water or certain other fluids, whereby heat may be transmitted from a fire or furnace to the interior of steam-boilers, or to tanks or other vessels containing water or other liquids intended to be boiled or evaporated.

The system of evaporation to which this invention relates is that in which the transmission of heat is effected by the circulation of a hot liquid through small tubes, or one endless tube, as represented in Plate XIII., at fig. 1,—where heat, being applied at *a*, the water in that part of the tube becomes expanded, and ascends through the part *b*, and thus puts the entire contents of the tube in motion. The heated water, therefore, necessarily passes through the vessel *c*, and gives out a portion of its heat to the cold water contained therein; after which, descending by superior gravity (arising from the contraction produced by an abstraction of the caloric taken up by the water in the vessel *c*,) through the part *d*, it returns to the part *a*, of the tube which is acted on by the fire, and there takes up another charge of heat: thus every particle of the water in the tube successively becomes the recipient and transmitter of caloric from the fire to the liquid to be boiled or evaporated.

When this system of evaporation has been heretofore adopted, it has been the practice to construct the coils of tubes, that pass through the fire and liquids, of wrought-iron tubes, formed in several pieces, and joined together by screws or other mechanical joinings, depending on mere workmanship for their perfect union. Now, instead of this, the patentee constructs two or more cellular vessels of iron, gun-metal, copper, or suitable alloys of copper: which vessels consist (as shewn at figs. 2, and 3,) of a series of transverse tubes *a*, leading into longitudinal open-ended tubes *b*, of larger area than the transverse tubes. The patentee places one or more of such vessels over the fire, and causes one or more to be immersed in and surrounded by the liquid to be boiled or evaporated; and he connects these vessels by means of bent pipes, so that the application of heat to the lower vessels will cause the required circulation of the liquid that is enclosed in them, and the consequent transmission of heat to the liquid intended to be boiled or evaporated. When the

cellular vessels are to be manufactured of cast-iron, the patentee prefers to form them of the kind of metal employed to make malleable cast-iron; and, when the castings are made, they are subjected to the ordinary annealing or converting process: the cores used for forming the transverse tubes or passages are got out through a series of holes, cast in the outer longitudinal tubes for that purpose; and the holes are afterwards closed by pins or screws. When the cellular vessels are to be of an arched or curved form, the patentee prefers, for the convenience of moulding them accurately, to cast them flat, and to bend them to the required curve after they have been rendered malleable. In some cases, the cellular vessels may be made of corrugated wrought-iron plates, which must be first pressed, stamped, or rolled into the required corrugated form: two such plates are then to be placed in contact (at a welding heat), in such manner that the concavities in the one are opposite to the concavities in the other, and are to be passed between suitably-formed rolls; by which means they will be united and formed into a cellular vessel, in the manner shewn by the section fig. 4. If preferred, the corrugated plates may be connected together by rivetting, as represented at fig. 5.

Fig. 6, is a transverse vertical section of a stationary boiler, having cellular vessels applied thereto. A curved cellular vessel *a*, formed in the manner exhibited at fig. 2, is placed beneath the boiler, and extends back over the fire-bridge *b*; so that the heated products of combustion must first act upon that part of the cellular vessel which is in front of the fire-bridge, then ascend through the apertures between the transverse tubes and impinge upon the bottom of the boiler, and finally descend through the apertures of that part of the cellular vessel which is situated behind the fire-bridge *b*, into the flue. Two cellular vessels *c, d*, are placed inside the boiler, and are connected, at the ends of the longitudinal tubes, by bent pipes, indicated by the dotted lines *e, f, g*. The heat of the fire causes the water to ascend from the cellular vessel *a*, through the bent pipes *e*, into the cellular vessels *c, d*; and, after a portion of the caloric has been abstracted, it returns through the bent pipes *f, g*, into the cellular vessel *a*: thus a constant circulation of the water is kept up, as indicated by the arrows. In order to permit the escape of any excess of water, caused by the expansion of the same, a pipe is attached to the apparatus, and furnished with a safety-valve; and any deficiency of water is supplied by a suitable feeding apparatus.

When this invention is applied to heating the boilers of locomotive and marine engines, the patentee employs a number of cellular vessels, as shewn at figs. 7, and 8, (which represent a longitudinal section and a transverse section of a marine boiler); and he places these vessels in upright positions, side by side: the transverse tubes *h, h,* of these vessels extend in an inclined direction between the longitudinal tubes *i, i;* and the longitudinal tubes of each pair of vessels are connected at the ends, in such manner as to ensure a free circulation of the water contained in the two vessels.

In some cases, the patentee proposes to place one or more cellular vessels above the level of the water in the boiler, in addition to the two series or sets above described, and to throw the injection or feed-water over the said upper vessel or vessels in the form of spray, to facilitate the generation of steam in the boiler. Instead of water being used as the heat-transmitting agent, the cellular vessels may be charged with pure oils or oleaginous matter, coal-tar, or such other fluids as boil only at a comparatively high temperature, or with such a mercurial amalgam as does not solidify at the ordinary atmospheric temperature: the object in using any of these matters is to avoid the internal pressure which water exerts when heated above 212° Fahr. Sometimes the patentee forms the sides of the furnace of cellular vessels; in which case, the transverse tubes will be placed in vertical positions.

The patentee states, that he lays no claim to the principle of generating steam or evaporating fluids by circulation through tubes, generally—such having been known and practised long before the date of his patent. He claims, First,—the various cellular vessels, such as are described, when the same are to be used to generate steam or evaporate fluids. Secondly,—the application, for the purpose of generating steam or evaporating fluids, of cellular vessels, when the same are used according to the arrangements comprehended in the preceding description: that is to say, more particularly when one or more cellular vessels are immersed in the water or liquid to be boiled or evaporated, and communicate with other vessels or tubes exposed to the action of the fire.—[*Inrolled April,* 1849.]

To William Henry Kempton, *of Pentonville, Gent., for improvements in reflectors and apparatus for artificial light.*—[Sealed 7th November, 1848.]

This invention relates, firstly, to improvements in the manu-

facture of reflectors, and, secondly, to improvements in apparatus for artificial light.

The improvements in the manufacture of reflectors consist in making them of earthen or pottery ware, and then producing a silver lustre on the surface thereof, in the same manner that such silver lustre has heretofore been produced on tea-cups, saucers, and other articles.

The second part of this invention is explained by figs. 1, 2, 3, 4, 5, and 6, in Plate XIV. Fig. 1, exhibits a reflecting lamp for lighting shop windows from the outside. The advantage resulting from this lamp is its great reflecting power, at small cost, compared with plated metal; and the novelty consists in the reflector *a*, which composes the body of the lamp, being made of earthen or pottery ware, and coated on the inside with silver lustre. The construction of the lamp is also simplified and improved, first, by the supply-pipe for the gas being introduced through the chimney of the lamp, and, secondly, by the use of a convex circular glass, inserted into a hinged rim, for the front.

Fig. 2, represents a parabolic railway signal lamp. In this lamp, the case for the reflector and the burner being in one piece, the reflector (which is made of earthenware, coated with silver lustre) can be easily attached to the burner, and will not be liable to get out of focus; it will also be less liable to damage from the heat of the lamp; will not be likely to be impaired by change of temperature; and will be altogether a much cheaper article than the plated metal reflector.

Fig. 3, shews what is termed the cornucopiæ light. The patentee says that this is a perfectly original mode of burning gas in glasses—the flame being made to issue horizontally from the burner, instead of vertically: by which plan the shadow from the burner and fittings is thrown back upon the branch and not upon the table or desk over which it is placed. The air to support combustion is admitted through the leaf *b*. The reflector *a*, may be used in combination with the burner and glass, or not, as may be preferred.

Fig. 4, exhibits a street lamp, the top or roof *a*, of which is to be made of earthen or pottery ware, coated with silver lustre; but in other respects the lamp is of the ordinary description.

Fig. 5, shews a drop roof lamp for railway carriages, combined with a reflector. The lamp may be of any suitable construction. The reflector *a*, is fixed to the roof of the carriage, and is made of such a form as to admit of the lamp being dropped through it.

Fig. 6, represents a gas stove. The silver-lustre reflector *a*, is made of a parabolic or conical shape, and is to be fixed in the recess of the fire-place, or in an open space. *c, c,* are the gas-burners. The patentee states that it is also intended that coals or charcoal should be burnt in a grate placed in the focus of a reflector of a parabolic or other shape, and the heat reflected into the apartment. He is aware that it has been before proposed to employ gas for heating rooms: he does not therefore claim the same generally, but only the mode of arranging the apparatus with a reflector constructed according to the first part of this invention.

The patentee claims, Firstly,—the manufacture of reflectors by applying pottery or earthenware, coated with silver lustre. Secondly,—the conveying the supply of gas through the chimney, and the application of the convex glass front, as described with reference to fig. 1,—also the arrangement of railway-lamp shewn at fig. 2,—also the arrangement of the gas-burner and apparatus, as shewn at fig. 3,—also the construction of the upper part of a lamp with a reflector, as shewn at fig. 4,—also the arrangement of drop roof lamp for a railway carriage, as shewn at fig. 5,—and also the arrangement of apparatus and reflectors for a gas or fuel stove, as shewn at fig. 6.—[*Inrolled May*, 1849.]

To John Browne, *of Osnaburgh-street, in the county of Middlesex, Gent., for improvements in fire-escapes, and in apparatus to facilitate persons employed in cleaning windows.*—[Sealed 11th November, 1848.]

This invention consists principally in certain apparatus which the patentee terms—the *balconlieu*, "as representing and affording the conveniences that may be derived from a balcony, either for painting or cleaning windows, or as affording an opportunity for attaching a fire-escape thereto, which would carry the person descending several feet beyond the walls of the house, out of the reach of the flame." The fire-escape, used by the patentee, is a knotted rope (with the knots about one foot apart), which, in case of necessity, is attached to the balconlieu.

In Plate XV., fig. 1, is a perspective view of the balconlieu. It consists of a wooden platform *a*, provided with a railing *b*, to prevent persons from falling out of it; and from this platform two beams or arms *c, c*, project, and are formed with numerous perforations, to receive the pins *d, d*, and *e, e*, by which

the balconlieu is securely retained in front of a window—the pins *d, d,* coming outside the window-ledge, and the pins *e, e,* serving to connect the beams *c, c,* with a perforated bar *f,* which extends across the inside of the window, and thus prevents the balconlieu from falling. To take off part of the weight from the beams *c, c,* and counteract the tendency to fall outwards, a drop-plank *g,* is provided, which can move up and down upon a fulcrum or hinge; so that when the balconlieu is being placed out of the window, the plank *g,* is in its elevated position; but, as soon as it passes beyond the stone window-ledge, it drops down and presses against the wall. *h,* is a balance-can, to hold the materials necessary for cleaning windows; *i,* is a bar, intended to serve as a seat; *j, j,* are two step-boards, on which the window-cleaner may stand, to enable him to reach the upper part of the window; *k,* is a wheel, by means of which the balconlieu may be moved from place to place, in the manner of a wheel-barrow; and *l, l,* are two handles, to be used when it is preferred to carry the balconlieu, instead of wheeling it about. To protect the occupant of the balconlieu from rain and the heat and glare of the sun, a canopy may be fixed over it, by attaching the rods, which support the canopy, to the railing *b.*

Fig. 2, represents what is termed—the "balcon-saddle," which is to be used by persons engaged in cleaning windows; but whether it is to be placed upon the ground or in the balconlieu the patentee does not state. It consists of two wide tapering-frames or ladders *m, m,* hinged or fixed together at the top. The top part *n,* is stuffed, to form a seat; there are steps or stirrups *o,* on each side, to rest the feet upon; and there is also a mounting-bar, to enable the window cleaner to reach as high as may be requisite. The balance-can, containing the materials used in cleaning the windows, is suspended from the bar *p.*—[*Inrolled May,* 1849.]

To James Clark, *of Street, near Glastonbury, in the county of Somerset, manufacturer, for improvements in the manufacture of boots, shoes, and clogs.*—[Sealed 26th October, 1848.]

The first part of this invention consists in making a clog, galoche, or over-shoe, with an elastic or elongating waist, which will yield to admit of the foot being inserted, and, by its tendency to contract, will retain the clog, galoche, or over-

shoe on the foot, without the employment of any of the ordinary fastenings.

In Plate XV., fig. 1, is a side view, and fig. 2, a view of the under side of a gentleman's galoche, constructed according to this part of the invention. The fore part *a*, may be made of leather, India-rubber, or gutta-percha, or a combination of these materials. The heel part *b*, is formed separately, and it may be made of gutta-percha, moulded to the last, and covered and lined with leather; or it may be constructed entirely of leather: in either case, the patentee prefers to make it with a box or sunk heel. The parts *a*, *b*, are connected by a band of vulcanized India-rubber or other elastic material *c*, extending up each side of the quarter and under the sole of the foot: if India-rubber is used, its edge should be interlaced with threads, so that it may securely hold the stitches by which it is attached to the heel and fore part. Ladies' or children's galoches are made in the same manner, except that the heels are not sunk or boxed.

The second part of the invention consists in so forming the heel part of a galoche that it shall clasp each side of the foot, under the ankle, and hold fast on the foot by the pressure on each side: for this purpose, the patentee uses gutta-percha, or leather, or springs, in the upper part of the heel.

The third part of this invention consists in the following mode of manufacturing boots, shoes, galoches, or clogs:—For the stiffening and foundation of the heel, the patentee moulds round, and partly under, the heel of the last a thin piece of gutta-percha; the upper part of this he introduces between the outer leather and lining of the heel part of the upper; and, by means of heat, or a solution, or both, he causes the gutta-percha to adhere to the outer leather and lining. He then takes a thin strap of gutta-percha, and (by the aid of heat, or a solution, or both) causes the same to adhere to the bottom part of the vamp and its lining, between which it is placed in such manner that there will be from half an inch to an inch lap round the foot and over the toes, and a projecting edge of gutta-percha, about half an inch wide, around the vamp. A piece of gutta-percha, or canvass coated with gutta-percha, is attached to the last as the in-sole; and on this the patentee lasts the upper, prepared as above described,—sticking the edge of the gutta-percha strap (which is attached to the upper) and part of the upper to the in-sole, by the aid of heat, or a solution, or both. He then applies over all a coating of gutta-percha solution, which he

allows to dry; and to this he sticks either a leather or gutta-percha sole: for a gentleman's boot, he uses pegs or nails to build the under part of the raised heel. The parts of this process which the patentee considers to be new are, the using gutta-percha as a stiffening for the heel, and using the gutta-percha, connected with it, inside the heel, as a foundation on which to build the heel; and also the mode of using gutta-percha, stuck between the upper and the lining of the lower part of the vamp and quarter of the boot, shoe, or galoche, as a means of waterproofing the leather at the lower part of the boot, shoe, or galoche, and at the same time strengthening the upper leather, which is very liable to crack at that part.

The patentee claims, Firstly,—the making a clog, galoche, or over-shoe, with an elongating waist. Secondly,—the mode of making a galoche to hold on without a fastening, by the pressure on each side of the heel. Thirdly,—the mode of making boots, shoes, galoches, clogs, and over-shoes, with gutta-percha stiffenings for the heels and sides of the vamps, rendered waterproof by inserting a thin piece of gutta-percha, which is also used in securing the upper to the sole.—[*Inrolled April,* 1849.]

To ARTHUR DUNN, *of Dalston, in the county of Middlesex, chemist, for improvements in ascertaining and indicating the temperature and pressure of fluids.*—[Sealed 12th October, 1848.]

THIS invention consists, firstly, in so combining and applying thermometric and electric apparatus, as to ascertain and indicate the temperature and pressure of fluids contained in vessels —principally applicable to steam and other close boilers; and, secondly, in combining electric apparatus with steam or pressure-gauges, so as to ascertain and indicate when the pressure of a fluid arrives at a determined point.

In Plate XIV., fig. 1, exhibits a sectional elevation of the apparatus, applied to a steam-boiler; and fig. 2, is a plan view of part of the apparatus. *a,* is a tube, which descends into the boiler below the water line, and is bent so as to come in contact with the side of the boiler; at its upper end a branch-pipe *b,* is fixed, into which two glass tubes *c, d,* are inserted. The tubes *a, b, c, d,* are charged with mercury; and in the tube *c,* a float *e,* with a piece of platinum, at its upper end, is placed. *f,* is a metal standard, fixed upon the

boiler, but insulated therefrom by the piece of glass f^1. At the upper part of the standard a sliding-piece *g*, is mounted, and fixed at any desired height thereon by a screw *h*; the sliding-piece *g*, carries the supporting stem of a metal bracket *i*, which is insulated by part of the stem, at *j*, being made of glass. The piece *g*, also carries the axis of a metal lever *k*, one end of which is attached to a wire *l*, that descends through a guide-hole in the cap c^1, into the tube *c*, and terminates in a point of platinum; the other end of the lever *k*, is furnished with a point of platinum, which stands beneath a small piece of platinum inserted into the bracket *i*: that end of the lever which is connected to the wire *l*, is made sufficiently heavy to raise the other end of the lever, so as to keep the platinum point in contact with the piece of platinum in the bracket *i*. *m*, is a wire, leading from the bracket *i*, to a bell apparatus *n*, of the kind employed in electric telegraphs; from this apparatus a wire *o*, leads to an electric battery at *p*, which is connected with the branch-pipe *b*, by the wire *q*; so that the electric circuit will be complete when the piece of platinum on the float *e*, and that at the end of the wire *l*, are brought into contact. In getting up the steam, the mercury will gradually expand with the increase of heat, and thereby cause the float *e*, to rise and complete the circuit—whereupon the bell at *n*, will ring; but as the float continues to rise, it will, by raising the heavy end of the lever *k*, depress the other end of that lever, and thus break the circuit; then, so long as the steam continues at the working pressure, the bell at *n*, will not again be brought into action: the use of the bell is merely to indicate that the apparatus is in working order at the time of getting up the steam. The distance that the wire *l*, extends into the tube *c*, must be so adjusted, that the wire will be raised, in order to break the circuit, before the working-pressure of the steam has been attained.

The part of the apparatus above described is not essential; but the patentee prefers to employ it in addition to the following part:—In the tube *d*, a wire *r*, is suspended, and is fixed therein in such a position, by means of the screw *s*, that its lower end (which terminates in a point of platinum) will be just above the mercury in the tube, when the latter stands therein at the height due to the degree of heat which is necessary to produce steam of the desired pressure in the boiler. From the upper end of the wire *r*, a wire *s*, is conducted to a bell apparatus at *t*; from thence a wire *u*, is carried to the battery at *p*; so that when the heat in the boiler rises above that which is requisite to produce steam of the desired

pressure, the mercury will rise into contact with the end of the wire *r*, and thus complete the electric circuit, and the bell apparatus at *t*, will be put in action. The tube *d*, may have a graduated scale applied to it, to indicate the temperature to the sight. Although this apparatus is chiefly intended for steam and other boilers where fluids are heated under pressure, yet such apparatus may be applied to ascertain and indicate (both near and at a distance) when the temperature of a fluid in a vessel has been raised to a determined degree of heat.

In carrying out the second part of this invention, the patentee uses the ordinary glass steam-gauge, instead of the thermometric apparatus above described; and he fixes a platinum wire at such a height in the gauge that it will be just above the mercury when the steam is at the working pressure; so that when the steam rises above the working pressure, the mercury will be elevated and come in contact with the platinum wire—thereby completing an electric circuit, and bringing into action a bell or other indicating apparatus.

The patentee claims the so combining and applying thermometric and electric apparatus as to ascertain and indicate the temperature and pressure of fluids. Also the combining electric circuits with steam or pressure-gauges, so as to ascertain and indicate the pressure of fluids.—[*Inrolled April*, 1849.]

To John Oliver York, *of No.* 24, *Rue de la Madeleine, Paris, engineer, for improvements in the manufacture of metallic tubes.*—[Sealed 21st November, 1848.]

The first part of this invention consists in manufacturing steel or iron tubes, to be used as tubular flues for steam-boilers or for other purposes, by casting or making hollow cylinders of steel or iron, in short thick lengths, and then rolling the same out until they are reduced to tubes of the desired length and thickness.

The material employed, by preference, for making the tubes is cast steel. A hollow steel or iron cylinder, with a bore of the diameter which the finished tube is intended to possess, or nearly so, having been made, the patentee rolls or elongates it, until it is brought to the desired length and thickness, by one or other of the two following modes. The first mode is carried out by means of apparatus shewn in part in Plate XV., at fig. 1, which represents a vertical section of the first two of a series of pairs of rollers: the machinery may contain five, six, seven, or more pairs of rollers; but the number of pairs

must be so limited, that heated hollow cylinders may be passed through the whole series, whilst the cylinders remain sufficiently hot to enable the rollers to produce the required effect. The heated cylinder *a*, is placed on a straight mandril *b*, which is a little longer than the tube to be made, and is of the same diameter as the bore of the intended tube; and the cylinder, with the mandril in it, is passed between the first pair of grooved rollers *c*, *c*, which reduce the size of the cylinder. The moment that the cylinder quits the grooves of the first pair of rollers, the workman turns it one-fourth of a revolution; so that the greatest pressure of the second pair of rollers *d*, *d*, (through which the cylinder is then passed) may be exerted upon a different part of the cylinder, for the purpose of ensuring the equalization of the thickness of the tube. The cylinder is passed in this manner through the several pairs of rollers (being turned one-fourth of a revolution on leaving each pair of rollers), and is thereby reduced to a tube of the desired size.

Fig. 2, exhibits, in vertical section, a part of the apparatus employed in rolling or reducing cylinders according to the second mode. The rollers, in this case, are considerably larger than those used in the machinery above described; and a stationary instead of a moveable mandril is employed in combination therewith. The mandril may be made in one piece, or in several pieces, which are screwed together; it must be long enough to extend throughout the series of rollers; and an enlarged piece, of the same diameter as the bore of the intended tube, is formed upon the mandril at the part which is situated between the two rollers composing each pair, as shewn at *b**. The heated steel or iron cylinder is placed upon the mandril, as shewn at *a**, and the mandril is firmly fixed; the cylinder is then pushed along the stem of the mandril until the end of the cylinder enters between the first pair of rollers *c*, *c*, which, rotating, draw the cylinder through between them and over the enlarged part of the mandril; and, after the cylinder has passed through the first pair of rollers, it is turned one-fourth round, and passed through the second pair of rollers: in this manner it passes through the whole series of rollers, and is converted into a tube.

When the tube is to be manufactured from a cylinder of wrought-iron, the patentee prefers to make such cylinder by taking a short thick bar of iron, of the shape represented, in transverse section at fig. 3, and of suitable dimensions, and bending or turning up the edges of the bar so as to form a cylinder, such as shewn at fig. 4. If a cylinder, made in this

manner, be heated to a welding heat, and subjected to the action of either of the two kinds of rolling machinery above described, the first pair of rollers will weld the joint and press the cylinder into a more perfectly cylindrical form; and the tube will be completed by passing through the series of rollers.

The second part of this invention consists in compressing the sides of tubes, intended to be used for the tubular flues of steam-boilers, in such a manner as to diminish the area of the tubes without diminishing or materially diminishing their interior surfaces. Figs. 5, and 6, exhibit the transverse sections of two tubes, the sides of which have been compressed: at fig. 5, the tube is compressed on two opposite sides; and at fig. 6, the tube is compressed on four sides; but tubes may also be compressed in this way on three sides or on more than four. The sides of the tubes are compressed by drawing them, whilst in a heated state, through pairs of tongs, suitably shaped for producing the required effect. Figs. 7, and 8, are side views of the jaws of two pairs of tongs, made of suitable shapes for compressing the tubes into the form shewn at fig. 5: the tube is first drawn once or oftener through the tongs fig. 7, so as to flatten the opposite sides; and then it is drawn through the tongs fig. 8, which complete the compression of the tube. The compression of the tube into the form shewn at fig. 6, is in like manner effected by means of the tongs figs. 9, and 10.

The patentee claims, Firstly,—the mode or modes of manufacturing steel and iron tubes by rolling or pressing short thick lengths of hollow cylinders of those metals upon or along straight mandrils and between series of rollers, in manner above described. Secondly,—the mode or modes of manufacturing steel and iron tubes by rolling or pressing short thick lengths of hollow cylinders of those metals over or along stationary mandrils and between series of rollers, in manner above described. Thirdly,—the mode or modes of compressing the sides of tubes, intended to be used to form such tubular flues as aforesaid, in manner above described.—[*Inrolled May*, 1849.]

To THOMAS CULLEN, *of London, Gent., for improvements in apparatus for steering ships and other vessels.*—[Sealed 18th November, 1848.]

THE first part of this invention consists in the application to ships of two additional rudders, one on each side of the sternpost, which rudders are hung upon the ordinary braces by

gudgeons, turned in the braces for that purpose, and are so fitted that, when not required, they do not interfere with or alter the effect of the ordinary rudder, but become, as it were, part of the stern-post or rudder-post.

In Plate XV., fig. 1, is a side elevation of the after part of a vessel;—*a*, is one of the additional rudders, to the front edge of which pintles are attached, and inserted into gudgeons formed for that purpose on the ordinary braces. Fig. 2, is a plan view of the after part of a vessel, exhibiting the manner of reeving the tiller ropes of the additional rudders. *b*, *c*, are the tillers of the additional rudders; and *d*, is the tiller of the ordinary rudder, which is placed between them. *e*, *f*, are the tiller ropes, which are connected to the ends of the tillers *b*, *c*, and, after passing round the stationary sheaves *g*, *g*, the sheaves *h*, *h*, (which are mounted on the tillers *b*, *c*,) and the stationary sheaves *i*, *i*, are attached to the barrel *j*. When this part of the invention is applied to new ships, the inner portion of the stern-post should be of as much greater substance than the part abaft as the fore or main part of the additional rudders would be,—so that when these rudders are in their places, their outer surfaces will be flush with the run of the ship: against the back of the stern-post is to be fixed a plate, of such width that it will project on each side beyond the stern-post to an extent equal to the substance of the after part of the blades of the additional rudders; and the keel (below which the additional rudders do not descend) being of the same substance as the inner part of the stern-post, each rudder will, therefore, be placed in a bed, secure from the action of waves and currents. The tillers of the additional rudders are free to work one over the other, but beneath the ordinary tiller; and they may be secured by lashing or by means of wedges.

This part of the invention may also be applied to screw-propelled vessels, which have two stern-posts, namely, the main or foremost one, and the false or aftermost stern-post, on which the ordinary rudder is hung. The additional rudders may be hung to the after stern-post or to the main stern-post; and, in the latter case, when not required, the blade should be turned forward.

The patentee states that the trouble of reeving new tiller ropes may be avoided by the following plan:—Divide the tiller ropes on each side, about midway between the barrel and the sheave or block at the side of the ship; and attach to each end of the part on the barrel a hook, and to each end of the other parts a cringle or eye. The other tiller ropes having

cringles at their ends and being kept rove, the part on the barrel may be hooked on to either at pleasure; and then the lashing being cast off the tillers, or the wedges knocked out, the additional rudders may be brought into operation instantly.

The second part of this invention relates to the application of a temporary rudder. In screw-propelled ships, where the propeller can be raised into the interior of the ship, a wooden or metal rudder may be lowered into the place of the screw;—the rudder being hung on gudgeons, carried by a piece of wood, which fits into a groove in the main stern-post; and the whole being let down into the place of the propeller.

The mode of applying a temporary rudder to ordinary sailing vessels is illustrated by figs. 3, and 4;—fig. 3, shewing the temporary rudder and its attaching case; and fig. 4, a stern-post, fitted to receive it. Each ship should be provided with an iron case *k*, which will fit the stern-post *l*, and is provided with braces and gudgeons, similar to those on the stern-post, but so placed, that they will not match with, or come exactly behind, the ordinary gudgeons, when the case is put on the stern-post. There are openings *m*, in the sides of the case, to receive the catches or projecting-pieces *n*, on each side of the stern-post; and the back of the case is lined with wood, in which apertures or recesses are made, to receive the gudgeons on the stern-post. A piece of wood *o*, is brought to a shape suitable for the main-post of the rudder, and fitted with braces and pintles; the braces are formed, at the after end, into a large gudgeon or hoop, to receive a spar *p*; and the upper braces gradually become shorter, so as to bring the spar against the head of the main-post, and admit of it pointing through the rudder-case. A heel or shoe-brace is made for the bottom; and the space between the main-post and the spar is filled with deals or boards, which are secured by bolting or wedging. The rudder, constructed in this manner, being hung on the gudgeons of the case *k*, the whole is put overboard; the spar is pointed through the rudder-case by a tackle leading through to it; the case is hauled on to the stern-post by means of the guys *q*, *q*, at the heel of the case, and the guys *r*, *r*, near the top; and then the case is raised into its proper place by the tackle: the guys *q*, *q*, and *r*, *r*, will prevent the case from being washed off; the catches *n*, *n*, will prevent it from descending; and, as the bottom of the case comes under the heel of the ship, it will thus be prevented from rising out of its place.

The patentee claims the following improvements in steering vessels:—First,—an additional rudder or rudders, let into one

or both sides of a ship's stern-post, or attached thereto, as described. Secondly,—the mode of arranging the tillers and tiller-ropes, for steering with the same. Thirdly,—the mode of applying an additional or a temporary rudder to vessels propelled by screw-power. Lastly,—the temporary rudder and case, and mode of preparing the stern-post to receive the same, as above described.—[*Inrolled May,* 1849.]

To RICHARD LAMING, *of Clichy la Garenne, near Paris, in the Kingdom of France, chemist, for improvements in the modes of obtaining or manufacturing sulphur and sulphuric acid.*—[Sealed 4th September, 1848.]

THE part of this invention which relates to improvements in the manufacture of sulphuric acid, is as follows:—The patentee takes pumice-stone (other porous bodies, which will not be destroyed by the processes to which they have to be submitted, may be substituted with more or less effect), and boils it in concentrated sulphuric acid; having drained off the acid, he immerses the pumice-stone in a little water, containing ammonia, which may be in the proportion of about 20 per cent.; he next dries the pumice-stone, and puts it into a retort, with about one per cent. of peroxide of manganese; then the retort, being closed, he gradually raises its temperature to near 600° Fahr.; and, when this is attained, he withdraws the fire, and leaves the retort to cool, without admitting the atmospheric air to the prepared pumice-stone. Other modes of preparing the pumice-stone, or other suitable porous body, may be substituted for the above: for example, it may be boiled in sulphuric acid, and then immersed either in nitric acid or a solution of an alkaline nitrate; or it may be boiled, or simply immersed, in a mixture of sulphuric and nitric acids; but the mode first described is the preferable one.

The patentee does not claim the application of porous bodies, generally, for making sulphuric acid by means of their catalytic energy, as platinum has been already used for such a purpose; but what he does claim is, the use of pumice-stone, and other cheap porous bodies, in conjunction with ammonia, as hereinafter explained; and also the modes which he has described, however they may be combined, for endowing such bodies with increased catalytic energy.

In order to make sulphuric acid by the catalytic agency of porous bodies, prepared as above described, the patentee prefers to expose them, in long narrow passages, to a current of

sulphurous acid gas, mixed with a due proportion of atmospheric air and a minute quantity of ammonia gas;—the said passages, for the most part, containing also water or the vapour of the water, with which the sulphuric acid may combine.

The patentee now describes the apparatus, shewn at fig. 1, in Plate XV., which he has devised for carrying out his invention; and which he claims, not only for the more immediate purposes of the said invention, but also as offering advantages, under the ordinary process, of making sulphuric acid, which advantages are not afforded by lead-chambers: among these are, economy in space, in original cost of apparatus, and in wear and tear. Fig. 1, exhibits, in section, a vertical tubular magazine of sheet-iron, for containing the catalytic substance,—the portion between A, and B, forming part of the main conduit for the gases. A, is an iron pipe, bringing the mixture of sulphurous acid and atmospheric air from the sulphur furnace, which may be of an ordinary kind; and B, is a pipe, also of iron, leading to the subsequent parts of the apparatus. The ends of A, and B, are formed into jackets, which surround the tubular magazine, and communicate with it by means of a great number of holes, made in the sides of the vertical magazine, and so small as to prevent the catalytic substance from passing through them,—at the same time that they allow the free passage of the gases. The top of the magazine is closed by a moveable plate or door; and to its lower end is adjusted a register C, by which the magazine may be emptied of its contents. The magazine is divided by three other registers D, D^1, and D^2, into four compartments;—the two middle compartments being always in communication with one another, so far as the gases are concerned, by means of apertures made in the intervening register D^1. This contrivance enables a workman, by withdrawing the registers in succession, beginning below, to remove, at any time, a determinate quantity of the catalytic substance, when its energy shall be expended, and to supply its place by fresh catalytic substance, contained in the magazine, without either arresting the work or admitting a current of cold air to the apparatus. The syphon-pipe and stop-cock E, serve to introduce, gradually, into the pipe A, from an elevated vessel, a small quantity of ammonia, dissolved in water: the ammonia should amount, in a given time, to about one part for every thousand parts of concentrated sulphuric acid made during the same period. The ammonia is preferred to be used in a caustic state; but it may be used com-

bined with either sulphuric or carbonic acid. That portion of the tubular magazine which forms part of the main conduit should be enclosed in a flue or a furnace, so as to admit of being thereby heated, at the commencement of the operation, to 550° or 600° Fahr.,—such a temperature being found conducive to the catalytic action.

Fig. 2, is a side view of one of four rows of columns F, shewn partly in section, with a cistern G, also in section, upon the cover of which two rows of columns are supported, and are each brought into connection with the cistern by means of short tubes in the cover thereof. Fig. 3, is a plan of two similar cisterns, with their four rows of columns standing in hydraulic joints The longitudinal division *a*, (represented by dotted lines) running along the middle of each cistern, has the effect of separating it into two parts, which communicate with each other at one end of the cistern. *b*, *b*, fig. 2, are transverse divisions, fixed to the cover and sides of the cistern, and reaching nearly to the bottom thereof; so that, when the cistern is supplied with liquid, they will, by forming water-tight joints, so intercept the passage over the surface of the liquid contents of the cistern, that the gases which arrive by the pipe B, and descend the column F^1, will, instead of passing along the cistern from one end to the other, ascend the column F^2, pass along the connecting pipe at the top thereof, down the column F^3, and up the column F^4, and so on through the whole series. From F^{11}, the gases pass by the cistern into F^{12}, (fig. 3,) and, on arriving at the end of the second row of columns, they quit F^{22}, by the pipe at its upper end, and enter the third row of columns at F^{23}. Proceeding in like manner through the two rows of columns of the second cistern, those of the gases which are incondensable finally quit the fourth row at F^{44}, passing out at its top to enter a curved pipe, which conducts them into a leaden chest H, for condensing the vapour; and which chest in its turn communicates by an ascending pipe (fitted to one of the two openings in its cover) with a chimney, the draft of which is sufficiently powerful to maintain a current throughout the whole conduit, of which each column forms a part.

Figs. 4, and 5, shew, on an enlarged scale, the internal arrangements of the columns, in which I, I, I, represent the flat basins destined to be filled with the catalytic substances, and serving also to keep back part of the water which enters each column in a slender stream, by overflowing the hydraulic joint at its summit, and which becomes a solution of sulphuric acid, more or less strong, as it is nearer to or further from the pipe

B. The water is brought to the hydraulic joints by small pipes and stop-cocks (not shewn), and it falls in each of the columns from basin to basin; thus successively washing the porous bodies contained in them, and thereby acquiring sulphuric acid, until, arriving at the base of the column, it overflows the hydraulic joint at that place, and falls into the cistern below. As the columns of the lowest numbers condense the largest quantities of sulphuric acid, it follows that the liquid in the cistern, at the base of the columns, is more concentrated as it is nearer to the cock K, by which it runs off into a common reservoir, constructed as near as possible to the said cock. The weaker acid, furnished by the columns of the higher numbers, becomes progressively stronger as it flows towards the cock K, where it acquires its maximum of strength. To keep back the weak acid from prematurely mixing with that which is stronger, transverse divisions *c*, *c*, are provided in the cisterns G; which divisions are half the height of the cisterns; and they are fixed to its bottom and sides in such a way as to form a compartment below each pair of columns: this arrangement prevents the products of the columns of higher numbers from mixing with the product of those of lower numbers, except by an overflow caused by the accumulation of liquid.

The cisterns G, are constructed of wood, lined with lead, and the columns may (some or all of them) be made of this latter material; but the patentee prefers making nearly the whole of them of stone-ware, as it is less expensive, and not subject to corrosion. On account of the high temperature of the gases, as received by the column F^1, from the pipe B, and from the consequent exposure of that column to atmospheric changes, it is desirable to construct the said column F^1, of lead; and if the apparatus be intended to work quickly, even one or more of the succeeding columns should also be made of lead; or, what will answer the same purpose, F^1, may be of larger dimensions. The body of each column consists of several tubes, put together by hydraulic joints. The forty-four columns, being each 2 feet in diameter by 10 feet high, are capable of producing 22 cwts. of concentrated sulphuric acid daily; and, provided the sulphur furnace be properly constructed, the proportion of sulphur necessary for this quantity will hardly exceed 7¼ cwts. It is convenient to erect the columns, with the cisterns at their base, on the first floor of a building; and in that case the sulphuric acid may be received from the cock K, into a reservoir close under the floor,

which will admit of its being concentrated during its descent to the ground.

Fig. 6, is a vertical section of one form of apparatus, which the patentee has invented for concentrating sulphuric acid, and which enables him to dispense with the ordinary stills of platinum. It consists of a column, made of stone-ware or porcelain tubes, cemented together with fire-clay, and fitted interiorly with a number of horizontal diaphragms L, which rest on ledges in the tubes, and have each a large hole in their centre. Between every two diapraghms there is placed a table M, somewhat smaller in diameter than the diaphragms, and supported horizontally thereon by feet, as shewn. Both the diaphragms and the tables are constructed with raised edges, which enables each of them to retain on its upper surface a stratum of acid about an inch in thickness. A syphon-funnel W, serves to introduce the weak acid through the cover of the column, and to deliver it upon the uppermost diaphragm; whence it falls from diaphragm to table, and from table to diaphragm, until the whole series being covered with it, the excess falls upon the hemispherical guard O, and then into the bottom of the column; then rising to a level with the highest part of the platinum syphon P, the end of which is inserted in the column, the concentrated acid runs out; and the syphon having thus been once filled, it afterwards maintains its level within the column at the height of the external orifice of the platinum tube. In the bottom of the column there is an opening Q, destined to admit air, heated, in any ordinary manner, to a temperature sufficiently high to boil the weak acid on the diaphragms and tables; and at the upper part of the column there is a corresponding opening R, by which the vapours generated, together with the air which generated them, pass out,—the former to be condensed in any known manner, or the whole to enter one of the columns F; which particular column should be of lead, on account of the high temperature thus introduced into it.

Instead of heated atmospheric air, other heated gases, such, for example, as the products of combustion, may be used in the concentrating column; but in such a case the pipe R, cannot be made conveniently to communicate with the series of columns F, as the gases might interfere with the sulphuric acid process. When air is used it need not be driven through the concentrating apparatus, as the draft existing in the series of columns F, with which it may be in communication, will serve to draw into it the air from the pipes in which it has been made hot. In order to protect the column from sudden

changes of temperature, and also to economize heat, it requires to be surrounded by a jacket of masonry, or other bad conductor of caloric.

Instead of passing heated air or gases through the concentrating apparatus, the orifice at its bottom may be closed, and the column packed in sand, in a large cylinder of iron; the whole apparatus may then be surrounded by a furnace or flue. In this way the heat necessary for the concentration would be supplied to the acid from the outside, through the iron, the sand, and the cylinders of earthenware. Or, instead of a column, a long continuous pipe of stone-ware or porcelain, or a series of pipes, of such materials, and of any convenient form and arrangement, may be used; the heat being applied in either of the two ways just described:—that is to say, either by heated air or other gases ascending in the inside of the conduit, and sweeping over the surface of the acid, descending, in a slender stream, in an opposite direction,—or by hot gases, or sand, or other substance, applied to the external surface of the conduit. In either case the process would be virtually the same as that for which the patentee prefers to use the concentrating column.

What he claims as his invention, with regard to the concentration of sulphuric acid, is the passing it in a slender stream—or the spreading it in a thin stratum, having progressive motion—over surfaces of earthenware, so arranged, that the acid comes into contact with surfaces more highly heated as it becomes itself more highly concentrated. He further claims the peculiar construction of concentrating apparatus, as shewn and described with reference to fig. 6, of the drawings.

When the apparatus hereinbefore described is to be applied to the old process for making sulphuric acid by aid of nitric acid, the tubular magazine (fig. 1,) should be suppressed, and its place supplied by a column, such as is represented in fig. 6. The opening Q, (fig. 6,) should be put in communication with the pipe A, (fig. 1,) which brings the sulphurous acid gas and atmospheric air from the sulphur furnace; and the pipe R, (fig. 6,) should be in correspondence with the column F^1. The cock K, by which the acid leaves the cisterns at the base of the columns, should be made to discharge itself continually into the syphon-funnel W, from whence it will find its way down over the tables and diaphragms, to escape by the platinum syphon P, into the reservoir prepared to receive it. The nitric acid may be introduced into the apparatus in the ordinary manner, or mixed with the water which

enters, by the hydraulic joints, at the summit of the columns F; but it will be needed in less quantity than usual, on account of the difficulty which this arrangement of apparatus opposes to the escape of the oxides of nitrogen. The pipe K, and also the concentrating column (both of which are composed of earthenware), should be protected from atmospheric changes, by enclosing them in some substance which is a bad conductor of heat.

The part of this invention which relates to improvements in making or obtaining sulphur is as follows:—In saturating the ammoniacal liquor of gas-works by a mineral acid, as is practised for making sulphate and muriate of ammonia, large quantities of sulphuretted hydrogen are set free. Attempts have been made to burn this sulphuretted hydrogen instead of sulphur, in the manufacture of sulphuric acid, but without success,—on account of the large proportion of incombustible carbonic acid which escapes from the gas liquor, mixed with the sulphuretted hydrogen. Now the patentee obtains the sulphur in a solid state, by introducing the mineral acid to the gas-liquor in close wooden vessels, and receiving the mixed sulphuretted hydrogen and carbonic acid gases in a close wooden vessel, containing a solution of sulphurous acid: the two latter re-agents reciprocally decompose one another, with the formation of sulphur, which may be run out with the liquid, and which, after a time, precipitates. To prevent a loss of the sulphurous acid in company with the escaping carbonic acid gas, the latter is caused to pass up a wooden column, through several superposed layers of saw-dust, kept wet by a shower of water falling on to the uppermost layer, and descending through it to the other layers. This weak solution, being drawn off from the bottom, serves to dissolve a fresh dose of sulphurous acid, for a subsequent operation.

The patentee claims, as his invention, the combination of the several steps in the operation which he has described for obtaining sulphur, and not any isolated portion of the process.—[*Inrolled March,* 1849.]

To ALEXANDER MC DOUGAL, *of Longsight, near Manchester, chemist, and* HENRY RAWSON, *of Manchester, agent, for improvements in the manufacture of sulphuric acid, nitric acid, oxalic acid, chlorine, and sulphur.*—[Sealed 21st November, 1848.]

THE first part of this invention relates to the manufacture of oxalic and nitric acid: it consists, firstly, in the substitution

of rice for sugar or starch in the manufacture of oxalic acid; and, secondly, in a method of treating the nitrous gases or fumes which are given off from the action of nitric acid upon the sugar, starch, rice, or other organic substances used in making oxalic acid.

The following is the method of treating the nitrous fumes: The fumes are conveyed into a vessel containing water, by a pipe, dipping below the surface of the water; air is permitted to enter into the vessel and mix with the gas, which bubbles up through the water; and the mixture of gas and air is drawn by a pneumatic apparatus through a series of vessels, similar to the first;—each having a tube dipping into the liquid, and being connected by a tube at the top with the next vessel: the nitrous gas is thus made to pass alternately into air and water, and is by this means converted into nitric acid. The patentees state that the reaction which ensues may be best expressed by the use of chemical symbols, as follows: —When 3 No. 4 is passed into water at a temperature of 100° Fahr., or upwards, 2 No. 5 + No. 2 results; the 2 No. 5 (*i. e.* two atoms of nitric acid) remain in solution, while the No. 2, which is an incondensable gas, bubbles through the liquid, and, mixing with the air in the vessel above the liquid, takes two atoms of oxygen from the air and becomes No. 4; which, passing again through the liquid, becomes nitric acid and nitrous gas, as before; and thus nearly the whole of the nitrous fumes or gas is re-converted into nitric acid. The nitric acid, thus obtained, may be used again for making oxalic acid or for any other purpose to which nitric acid can be applied. There are several chemical processes in which nitrous gas is given off; and to each of these the above method of treating the gas or fumes may be applied.

The patentees claim, under this head of their invention, the use of rice in the manufacture of oxalic acid; also the manufacture of nitric acid, by passing the lower oxides of nitrogen alternately into water, or an aqueous solution of acid, and air, containing oxygen, whether these lower oxides are obtained in the manufacture of oxalic acid, or in any other process.

The second part of this invention consists in a method of manufacturing sulphuric acid, by the use of a series of vessels similarly arranged to those above mentioned, only that the first vessel is connected with a sulphur burner. The first vessel is charged one-third full of nitric acid, and the others one-third full of water; the burner is then charged with sulphur; and, lastly, the pneumatic apparatus, connected with

the last vessel, is put in action. Air being thus drawn over the ignited sulphur, sulphurous acid and air pass into the nitric acid in the first vessel, where a portion of the sulphurous acid is converted into sulphuric acid, at the expense of the nitric acid; the uncondensed sulphurous acid passes with the air and nitrous gas into the second vessel; and so they pass alternately into water and air, until the processes of oxidation and condensation are completed. When the working has been continued for some time, it will be found that the nitric acid has entirely left the first vessel, which now contains sulphuric acid, nearly pure: the same would take place with each of the other vessels, if the nitric acid, which has been condensed in the vessels toward the end of the series, was not returned to the first vessel; so that when the first vessel is exhausted of nitric acid, the sulphuric acid, which it contains, must be removed, and the vessel supplied with nitric acid from the vessels lower in the series. Sulphuric acid is thus obtained without the loss of any nitric acid, as the lower oxides of nitrogen given off in the oxidation of sulphurous acid are again converted into the higher oxides, and again used for the conversion of sulphurous into sulphuric acid.

The patentees claim the manufacture of sulphuric acid by the process above described.

The third part of this invention consists in the following improvements in the manufacture of chlorine:—Any of the chromates or bichromates are treated with hydrochloric acid, either in its free or nascent state; and thereby chlorine is given off and a chloride or sesquichloride of chromium, and a chloride of the base of the chrome salt, are formed. The latter products are treated with nitric acid, and the hydrochloric acid distilled off; and thereby nitrates of chrome, and of the base of the original chrome salt, are obtained. The nitrates being exposed to heat, the lower oxides of nitrogen are given off; and these are oxidized and condensed, as described in the first part of the invention. By the action of heat upon the nitrates, the patentees also obtain, after the oxides of nitrogen have been driven off, the chromate or bichromate first employed, which may be used in the production of chlorine as before. The chromate of lime is preferred to be employed in the above process.

The patentees claim the use of the chromates or bichromates in the manufacture of chlorine, in connection with the use of nitric acid for the reconversion of the lye products into the chromates or bichromates originally employed.

The fourth part of this invention consists in manufacturing

sulphur, by passing sulphuretted hydrogen through a heated tube: by this means the gas is decomposed,—sulphur being deposited and hydrogen given off.

The patentees claim the decomposition of sulphuretted hydrogen by heat, from whatever source obtained.—[*Inrolled May*, 1849.]

To James Anderson, *of Abbotsford-place, in the city of Glasgow, North Britain, starch manufacturer, for a certain improved method of separating the different qualities of potatoes and other vegetables.*—[Sealed 11th November, 1848.]

This invention consists in a method of separating or dividing potatoes and other roots or vegetables into two or more classes, according to their economical values.

The system of separation which constitutes this invention is founded on the fact of the ascertained variation of the specific gravity of potatoes and other vegetables or roots, being in nearly strict agreement with the relative economical value of the substance thereof. The patentee states, that the specific gravity of a potatoe containing about 20 per cent., by weight, of solid nutritious matter is equal to 1.080 (distilled water, at a temperature of 56° Fahr., being considered as unity); or, in other words, it will sink in a liquid having a density of about 16° of Twaddell's hydrometer. Again, the specific gravity of a potatoe possessing about 30 per cent. of solid nutritious matter is 1.120; and it will sink in a liquid that has a density of 24° Twaddell.

The separation of the roots is effected by putting quantities of them, loose, into a liquid the specific gravity of which is equal to that of the required classes of such roots: the specific gravity of potatoes varies, as a general rule, from 1.075 to 1.120. The patentee prefers to make his testing or separating liquid—which may be water mixed with a quantity of common salt, clay, or other suitable substance—of such a density as to agree with the lightest of the class of potatoes which he intends to select or separate as the best. The potatoes on being put into such liquid, say of a specific gravity of 1.100, or about 20° Twaddell, will be almost immediately divided into two classes: those of a greater specific gravity than the liquid will sink; whilst all such as fall short of that point will float. The floating potatoes are to be removed from the surface of the liquid; and then the heavier and more valuable ones at the bottom may be taken out. If it be

desired to separate the potatoes into more than two classes, the process may be repeated, by again putting the lighter or heavier potatoes into a liquid of less or greater specific gravity. Various other vegetables, such as turnips, carrots, and parsnips, may be separated by this process.

The patentee claims the system, method, or process of assorting, separating, or dividing potatoes and other roots or vegetables into different classes or qualities, according to their ratios of specific gravity, by the use or means of a liquid or liquids the specific gravity of which is in accordance with that of the separate or different classes of roots which may be required to be obtained, in whatever manner or by whatever means the same may be applied or put in practice.—[*Inrolled May*, 1849.]

Scientific Notices.

ON PATENT LAW REFORM.

ARTICLE V.

THE object of our former papers (with the exception of the third) has been to attempt to explain the grounds upon which many weighty objections may be taken to the present mode of granting patents; but none of our remarks have gone to impugn the provisions of the law itself; it is to the *practice* that our strictures have been directed; for, under the existing system, inventors are exposed to a variety of fraudulent surprises, against which it is impossible for them to guard, and which, in fact, the very tenor of the grant (it being issued as a matter of grace and favor) may not unreasonably be supposed to encourage. If, however, these snares—the abuses of the system—are once fairly escaped, the patentee will, we believe, find his property as jealously guarded, and as safe from molestation, in this as in any other country. We would not, therefore, in urging the cause of patent law reform, desire to set aside a single precedent which is now held as the rule in our law courts—that is, as far as the points of validity and invalidity are concerned; for justice to the patentee has now for many years taken the place of that vindictiveness which, in our earlier decisions, is too often so evident against everything taking the shape of a monopoly. It is, in fact, to the decisions of the judges that patentees must look, not as a commentary merely on the law of patents, but, in the absence of any positive and defined enactments, as the foundation upon which their legal claims to justice are based. The present paper, in contradis-

tinction to the preceding ones, will treat of a defect in the patent law itself, or rather of an anomaly which is presented by the present system of granting three distinct patents for England, Scotland, and Ireland: the subject will be particularly considered in its relation to the final decision of the House of Lords upon the well-known case of Brown *v.* Annandale.* It is not infrequent that difficulties present themselves to our legislators when dealing with matters that bear upon the rights and privileges of Scotland, although those rights were established by law when Scotland was an independent kingdom, and have since been confirmed by the Act of Union: a question therefore, which, in addition to the main subject under discussion, required the precise nature of the royal prerogative to be ascertained, could not fail of being rather hard of solution. The case of Brown *v.* Annandale was of this kind; and it brought forward a point for decision, which, if it had ever before been settled, was neither known to the public nor to those most conversant with patent law. It was simply this:—Whether or not, according to the laws of England, Scotland, and Ireland, as they now stand with regard to letters patent for inventions, the condition of novelty, inserted in the grants, extends beyond those parts of the United Kingdom respectively for which the grants are made; or, in other words, whether the prior knowledge of an invention in one kingdom would render a patent, obtained for that invention in another, invalid? The decision of the Lords was against the validity of the patent obtained under such circumstances, and apparently with great reason; but therefrom resulted the anomaly the non-removal of which, although seven years have now passed since the judgment was given, shews most clearly the neglect which the interests of inventors suffer from the legislature. It had generally been believed that the conditions under which patents are granted should be taken literally, viz., that, on the ground of want of novelty, a Scotch patent could be declared void only when it should appear "dictam inventionem quoad publicum ejus, in illa parte Regni nostri Uniti, *Scotia* vocata, usum et exercitum, non esse novam inventionem." England was, therefore, in practice, considered as a foreign country with respect to Scotland, as far as patent matters were concerned; and such appeared to be the opinion of the Attorney-General (now the Chief Baron of the Exchequer), when the cause came for final decision to the House

* For an elaborate report of this case see Vol. XXI., p. 274, Conjoined Series.

of Lords.* The matter of dispute seemed really to lie in this—whether, by the crowns of England and Scotland descending to one and the same person, the royal prerogatives were naturally blended into one? or whether, in fact, the sovereign is not the holder of two distinct offices, as chief magistrate or ruler in the two kingdoms? as was certainly the case when Hanover formed an appanage to the British Crown. The granting of separate patents for the two kingdoms was, in itself, a presumptive ground for the opinion that the powers belonging, as of right, to the occupant of the Scotch and English thrones, remained distinct (even as the laws which existed in the two countries at the time of the union still remain) and could only be applied within the limited territories over which they originally extended. Under this view of the subject, it is clear that the royal prerogative, when exerted to grant patents for invention, in a manner conformable to the practice that existed before the union, should confer the same privileges, as heretofore, on the holders of such grants, unless special provisos are inserted in the letters patent. The first and true inventor in Scotland would, in that case, be held to be the first introducer of the invention in that kingdom,—irrespective of the want of novelty as regarded England. The decision of the Lords has, however, irrevocably settled this point; and, therefore, in order to the maintenance of a valid patent for any part of Great Britain and Ireland, or the colonies, novelty of invention as regards the whole empire is an essential.

Let us now see how this bears upon the interests of inventors.—An inventor usually applies first for his English patent; and, as he must get the great seal before he can safely pursue his experiments, so as to test the value of his invention, he will have to incur the whole expense of that patent. But we will suppose that he is also desirous to secure his right to the invention in Scotland and Ireland, and that he will be ready to apply for patents in those countries immediately he is satisfied of the value of his improvements;—in the face of the decision

* Mr. Hindmarch, in his "Treatise on the Law of Patents," makes the following remark, which is pertinent to our subject:—"Until recently, it was supposed that an invention would possess sufficient novelty to support a patent, if it were new in England and Wales, although known in Scotland or any other part of the United Kingdom; and therefore it has been customary, in a petition for a patent, merely to allege that the invention is new in England, Wales, and Berwick-upon-Tweed. But the case of Brown *v.* Annandale, in the House of Lords, has decided that an invention must be new in every part of the United Kingdom; and therefore a petition for a patent ought now to state that the invention is new within this realm, or within the United Kingdom." (p. 510.)

in the case of Brown *v.* Annandale he can pursue but one of two equally dangerous courses,—either to patent before he has experimented, and thus risk the loss of the money required for the three patents, by the probability of the invention proving useless,—or to brave the chance of publication, from the knowledge of his experiments getting abroad, and, after having ascertained the value of his discovery, to apply for the Scotch and Irish patents. Both of these lines of conduct are opposed to prudence; and yet the law allows of no other. It is not when we consider the patent laws in connection with England merely, as we have hitherto done in these papers, but as embracing the United Kingdom, that we can appreciate, to the full extent, the difficulties in which inventors are placed, in relation thereto. They have always been taught, by the English law, that rashness is a qualification essential to a patentee; for, before he is allowed to submit his invention to the only unerring test of its pecuniary success, viz., to public opinion, and, in many cases, before even he can satisfy himself of its practicability, he must pay the whole cost of the patent right. And what, in too many cases, is the value of the grant thus obtained, when an opportunity of experimenting has been denied, and neither a description nor a drawing of the alleged invention (the simple act of preparing which papers might possibly be sufficient to convince the inventor of his fallacious notions) has been required as a preparatory to conferring the grant? This question may be well answered in the words of Mr. Webster, who, in his work on the "Subject-matter of Letters Patent," says, while discussing the propriety of making a patent the inducement for the development of ingenuity, that "it is exactly proportioned to the value of the invention to the public; if the invention be useless, it is soon lost sight of, and the patentee derives no benefit from it; but if it be of great utility, and come into general use and exercise, the patentee receives a corresponding reward." Patentees then, whose inventions prove unprofitable during the existence of their patent, either through the invention being altogether impracticable, or, as is sometimes the case, from appearing in advance of the age, will receive no equivalent for their outlay; but government, and a host of sinecure placemen, will have benefited from their folly or misfortune. This, surely, cannot be considered a wise way of encouraging invention, which, to use the language of the American Commissioner of Patents, in a recent report to Congress, "aims to improve what already exists in a form more or less imperfect, and to adapt itself to the prac-

tical wants of society." The aim, surely, is not so ignoble as to deserve such depressing encouragement. But, now that the presumed privilege of deferring the application for the Scotch and Irish patents is swept away, and that a patent will be held void, if the invention can be proved not to be new in any other portion of the realm than that to which the grant extends, the inconvenience which, when the cost of but one patent was risked, was always looked upon, even by the wealthy manufacturer, as a hardship, is now much greater than ever,—as all the three patents, to make the matter perfectly safe, must bear date before any experiments of a public or useful nature are attempted. The discouraging position of the poor inventor, especially, is, by this new reading of the law, greatly aggravated; for—supposing for a moment the former interpretation to be correct—if, by any means, an inventor could raise a sufficient sum to pay for the least costly of the patents, and, by working out his invention in Scotland, he could realize a sum equal to the cost of the English and Irish patents, he might then, from the hard-earned profits of his industry, be enabled to meet the demands of the government for the stamps on these encouragements to ingenuity, and satisfy the cloud of sinecurists and others, who, without any shew of legality, further than "immemorial custom," divide the patentee's gold amongst them. At present, if the needy inventor is so fortunate as to be able to secure an English patent, he allows who will to benefit by his discoveries in Scotland and Ireland, and is only too happy, if the use there made of his ingenuity is not turned against himself by the introduction into England of the manufactured article, whatever it may be, at a price below that which he considers a proper remuneration to himself.

If, now, we were to judge of the justness of our system of granting protection to inventors, by the side of the dogma put forth in our first paper, and which, however it may be disputed here, is the basis whereon more than one system of patent law is founded, viz.—that an inventor has an indefeasible right to the benefits resulting from the exercise of his own ingenuity and skill—we should then perceive the impolicy (to use no stronger term) of conferring this right upon the inventor by means of three patents. When he has made his application for, say England, it is referred, by command of Her Majesty, to the Attorney-General, who takes the matter into his consideration, and, in the ordinary course, reports thereon, to the effect that, "as it may be reasonable for your Majesty to encourage all arts and inventions which may be

for the public good, I am humbly of opinion that your Majesty may, by your royal letters patent, grant to the petitioner the sole use, benefit, and advantage of his said invention, &c." It is, therefore, evident, from the Attorney-General's satisfactory report, that the inventor's application is one of a reasonable nature; and further, from the wording of the report no other inference can be drawn but that, if the invention is of any use, it will minister to the public good. The Queen then, as the depository of the power for rewarding ingenious men, and acting upon the report of the law adviser of the crown, issues her warrant, to the effect that, "we, being willing to give encouragement to all arts and inventions which may be for the public good, are graciously pleased to condescend to the petitioner's request. Our will and pleasure, therefore, is, that you prepare a bill for our royal signature, to pass our Great Seal of our United Kingdom of Great Britain and Ireland, containing our grant unto him, the said * * * of the sole use, benefit, and advantage of his said invention." But upon what grounds is the grant confined to England, if the prerogative of the British crown is not divisible into three parts, as we have suggested? for the reasons for conferring the grant at all would be as strongly in favor of one part of the empire as another; and why should the sovereign, when exercising her legal privileges, be necessitated to perform three precisely similar acts in succession, when one command would be sufficient for the purpose? We have three favorable reports upon one and the same matter from the crown lawyers of England, Scotland, and Ireland, respectively—three royal commands to prepare the papers for three patents—and three keepers of the Great Seal to give vitality to the three patents. Whereas, the inventor, if entitled at all to the sole use, benefit, and advantage of his invention, from the public good which is expected to be derived therefrom, is, certainly, as much entitled to protection throughout the whole empire, of which he is a subject, as in a part thereof: and this privilege he undoubtedly possesses. It is of no small moment that the sovereign, the conservator of her subjects' rights, should be placed in a false position with regard to the public, by this mode of granting protection to the inventor; for the House of Lords says, in substance,* that the Queen is the sovereign of *one realm*, or a United Kingdom; and, if so, why may she not, under her prerogative, grant a patent to the first and true inventor of any useful discovery within the whole realm?

Now, by the act of granting a patent, which extends over

* Brown *v.* Annandale.

one of her kingdoms, the Queen is made to own the justice of the inventor's claim to encouragement and protection; and, when his means are inadequate to the further prosecution of his claims in the other portions of the empire, the royal decree is virtually to this effect:—"your right to protection, which is indubitable, has been already acknowledged; but the further exercise of my prerogative on your behalf can only be secured by purchase." We could have understood the need of three patents, had the sovereign been the holder of three sceptres, with each of which certain royal privileges were inherited;—the interpretation, however, of the word "realm" by the House of Lords, has completely dispelled this legal fiction, and left us no ground for supposing that either law, justice, or policy, would be sacrificed, by discontinuing the granting of three separate patents for the United Kingdom.

The decision of the Lords, in Brown and Annandale's case, had the effect, not merely of putting all or nearly all the then existing Scotch and Irish patents in jeopardy, but it has raised doubts as to what is really a publication, which can by no means be satisfactorily determined. If the opinion of the legislature is to be a guide to the decision of the judges, then must the enrolment of the English specification, prior to the sealing of the Scotch and Irish patents, render the latter invalid; for, in a private Act, passed in August, 1848, to enable "The Timber Preserving Company" to purchase and work certain letters patent, we find the following clause:—

"And whereas the enrolment in the High Court of Chancery of the specification of the invention, the sole privilege of making, using, exercising, and vending which within England, Wales, and Berwick-upon-Tweed, the islands of Guernsey, Jersey, Alderney, Sark, and Man, was granted by the recited letters patent of the ninth day of July, one thousand eight hundred and forty-one, to the said Charles Payne, his executors, administrators, and assigns, as aforesaid, was made on the eighth day of January, one thousand eight hundred and forty-two, and doubts have been raised whether such enrolment was not such a publication of such invention as to render the validity of the recited letters patent of the thirteenth day of March, one thousand eight hundred and forty three, for Scotland, and the recited letters patent of the twelfth day of August, one thousand eight hundred and forty three, for Ireland, respectively, questionable: And whereas, the enrolment in the same Court of the specification of the invention, the sole privilege of making, using, exercising, and vending which within England, Wales, and Berwick-upon-Tweed, the islands of Guernsey, Jersey, Alderney, Sark, and Man, and the Colonies and Plantations abroad, was granted by the said letters patent of the twenty-ninth day of June, one thousand eight hundred and forty-six, to the said Charles Payne, his executors, administrators, and assigns, as aforesaid, was made on the twenty-ninth day of December, one thousand eight hundred and forty-six, and doubts have been raised whether such enrolment was not such a publication of such invention as to render the validity of the recited letters patent of the thirtieth day

of December, one thousand eight hundred and forty-six, for Scotland, and the recited letters patent of the twenty-seventh day of February, one thousand eight hundred and forty-seven, for Ireland, respectively, questionable: And whereas it is expedient that such doubts should be set at rest: Be it therefore enacted, That the enrolment of such specifications, or either of them, shall not be deemed a publication of such inventions, or either of them, so as to affect the validity of the recited letters patent of the thirteenth day of March, one thousand eight hundred and forty-three, the twelfth day of August, one thousand eight hundred and forty-three, the thirtieth day of December, one thousand eight hundred and forty-six, and the twenty-seventh day of February, one thousand eight hundred and forty-seven, respectively, or any of them."

From this confirmatory clause having received the sanction of Parliament, we may fairly infer, that although there is but a doubt as to the enrolment of a specification in one kingdom invalidating a post-dated patent for the same invention in another kingdom, yet the doubt is not in favor of the patentee. This is therefore a further hardship upon inventors; for, even by letting his invention lie idle (after having obtained one patent), and sacrificing the benefits that might be derived therefrom, until he is enabled to find the means for securing all his patents, he will not then be in a position to effect his purpose. His only sure plan of securing his invention, is to withhold his applications until he is provided with funds to complete the English, Scotch, and Irish patents simultaneously: he will then have an excellent opportunity of exercising that qualification to which we previously alluded, as necessary to a patentee; for, whether the invention be useful or not, he will have risked, in one venture, the whole cost of the patent, without the hope of one farthing returning, unless he strenuously exerts himself to carry his improvements into practical use. What a contrast does the system under which ingenuity is fostered in this country present, to that over which the American Commissioner of Patents presides! While our practice is to stifle invention in the bud, the representative of the transatlantic system holds the following language:—"The field of invention is as illimitable as the world of mind and matter; there is, therefore, ample room for all explorers after the valuable treasures which yet, in rich abundance, lie hidden and undeveloped, and which will require the thought and labor of ages to discover and reclaim for the uses of mankind." Let us hope that a brighter era is dawning for English inventors, and that the "movement from without," which is now again commencing, will end in something more satisfactory and creditable to the country than that of the years 1833, 4, and 5.

PRIVY COUNCIL CHAMBER, WHITEHALL.

May 16*th*, 1849.

CORAM,—LORDS BROUGHAM AND LANGDALE, AND THE JUDGE OF THE ADMIRALTY COURT.

BODMER'S PATENT.

THIS case came on for hearing on the petition of Mr. Thomas Hornby Birley, of Manchester, cotton-spinner, praying the extension of the term of letters patent, granted to Mr. John George Bodmer, dated 27th May, 1835, for "certain improvements in machinery for preparing, roving, and spinning cotton and wool."

Mr. Hill, Q.C., and Mr. Webster, appeared for the petitioner, and stated that the petitioner was very extensively engaged in business, as a cotton-spinner, at Manchester, and that Mr. Hugh Hornby Birley, deceased (of whom the petitioner was sole executor), was in partnership with the patentee as makers of machinery of various descriptions, and (*inter alia*) of that to which the patent in question related.

The present application was made under the provisions of an Act of Parliament, passed in the 5th and 6th William IV., by which the judicial committee may report to the crown that an extension of letters patent should be granted for any term not exceeding seven years, and the crown is thereby empowered to grant such extension. It appeared that Mr. John George Bodmer, after numerous experiments, and by the exercise of great inventive genius and mechanical skill, had made the several improvements in cotton-spinning machinery which formed the subject of the patent, the extension of which was now sought to be obtained. That the inventions detailed in the specification, in fact, constituted a series of improvements in such machinery, all of which were new and useful; but that those which had got more extensively into use were such as were applicable to the carding engine, scutching machine, and blowing machine. These improvements were brought under the notice of Mr. Hugh Hornby Birley (since deceased), and the result was the formation of a partnership between Mr. Bodmer and Messrs. Birley, for the purpose of carrying on the business of machine-makers, at Manchester; and large sums of money had been introduced by Messrs. Birley, as capital, into that partnership concern.

The learned counsel then proceeded to state that efforts were made by the Messrs. Birley to get the improvements introduced into various mills, two travellers having been employed for the purpose; but that those efforts had been unsuccessful,—owing in great part to the reluctance of spinners to adopt changes in their machinery; which adoption necessarily led to a hindrance in their business of greater or less amount, and might moreover be found unsuitable, and not an improvement, but the contrary.

In support of the case for the petitioner, Mr. Bright, M.P. for Manchester, gave evidence that certain of the improvements in

question had been applied to carding engines in his own mill, and that they were found to be very useful.

Mr. Newton, of the Office for Patents, Chancery-lane, gave evidence at considerable length upon the utility and novelty of the different inventions included in the specification, and fully detailed the advantages connected with those several inventions, as applied to the preparation of cotton, up to the point of its being brought into the state of roving; explaining to their Lordships that although the specification seemed to embrace nearly thirty different inventions, these were in fact properly reducible to five or six, as they were severally applicable to different classes of cotton machines.

The evidence of utility was supported by Messrs. Bradshaw and Broadbent; and four or five other cotton-spinners, from various parts of Lancashire and Cheshire, proved that the charge made for the use of the patent was fair and reasonable.

Evidence was given of the nature and character of the experiments made by the patentee; and Mr. Bodmer, jun. (his son) proved, by a statement made from the books of the concern, that a cash loss of £3,039. 8*s*. 8*d*. had been sustained by the partnership concern, in endeavouring to introduce the various improvements; and to that sum £2,940 had to be added for the interest on capital, increasing the loss to nearly £6,000.

At the close of the petitioner's case, the Attorney-General addressed the counsel opposing the prolongation on behalf of the crown. At the conclusion of his speech the council-chamber was cleared, and their Lordships having deliberated, the parties were again admitted.

Lord Brougham delivered judgment, eulogising the inventions to which the patent related, and proceeded to state that the public were indebted to the Messrs. Birley for the manner in which they had supported the patentee in bringing out and prosecuting the very useful improvements in question. Their Lordships had determined to grant a prolongation for the term of five years.

ON THE EMPLOYMENT OF MERCURY AND SULPHURIC ETHER IN PHOTOGRAPHIC OPERATIONS.

BY M. E. LABORDE.

[Translated for the London Journal of Arts and Sciences.]

M. Charles Chevalier, in one of his manuals of photography, has stated that he thought the pellicle of oxide which forms on the surface of the mercury, would be an obstacle to the production of a good photographic picture. My own experience has proved that this oxidation, even when not apparent, is injurious to the perfection of the image. It is not sufficient to wash, dry, and filter the mercury, for it is only after recent distillation that this metal has its full value; but this operation not being within the reach of all persons who take an interest in photography, I

will point out a very simple means which is equally efficacious with the distillation of mercury:—It is only necessary to spread upon the surface of the mercury a layer of sulphate of iron, reduced to powder; the iron in this salt, easily passing into a higher degree of oxidation, reduces the oxide of mercury, and thus gives to the purified metal its full value for photographic purposes.

The following experiment proves the efficacy of this application of sulphate of iron:—It is well known that on placing a powerful electro-magnet in the circuit of a voltaic pair, a very bright spark is produced on the surface of the mercury at the moment when one of the connecting wires is withdrawn; this spark is accompanied by an abundant white vapour, consisting of oxide of mercury, more especially when the mercury forms the positive pole of the battery. I had the idea of employing this vapour for the purpose of producing an image in the mercury box, and by means of certain mechanism (the construction of which it is unnecessary to explain) I produced a series of sparks underneath a plate which had received the luminous impression: the mercury box soon became filled with the white vapours, which were produced in abundance. Not only was no result obtained, but it was afterwards impossible to produce a picture by the aid of the mercury which had been thus experimented on; and, even after having been filtered several times, it did not furnish a better result. It was washed with hydrochloric acid, then in cold water, and carefully dried; but it then only produced slight traces of the image; however, upon its surface being covered with a layer of sulphate of iron, the mercury recovered all the properties of recently distilled mercury.

Some time since I made known the employment of sulphuric ether in the mercury box; and this process, which produces results of great beauty, is, I believe, definitively adopted in the photographic process. The etherial vapours readily take up the oxygen; and, as the mercury only acquires its full power when completely deprived of that gas, it is probable that the ether helps to purify the mercurial vapours. It would be erroneous to suppose that the vapours of metallic mercury, formed in the air, are deprived of oxygen; for, if they are condensed in any suitable vessel, the metal will become covered with a pellicle. The same result will take place when deutoxide of mercury is distilled; it being at the same time decomposed. It is true that I had been induced, by other reasons, to try the ether;—I point these out here because they still retain all their value.

On adding ether to a solution of chloride of mercury, the ether takes up from the water nearly all the salt it contained. This peculiar action of ether upon mercury and its compounds was the cause of an experiment, which has completely succeeded.

Without the action of ether in the formation of the image being susceptible of a perfect explanation, it is understood up to a certain point, as it takes place in presence of mercury and chloride, or qromide of mercury.

The sulphate of iron also furnished me with very good means

for distilling the mercury, which I think it will be useful to make known. The distillation of mercury is accompanied by shocks, which render it a matter of difficulty to carry on the operation in a regular manner,—to say nothing of other causes, such as the pressure of the metal upon itself below, &c. There is one difficulty which arises from the presence of the pellicle of oxide formed on its surface; this pellicle confines the metal, and obliges it to take a temperature superior to its boiling point under the simple pressure of the air; and, on the obstacle breaking, the instantaneous production of vapour produces a jerking motion of the metal.

This is an effect similar to that which is frequently exhibited when salts are concentrated until a pellicle forms on them; but if a retort be employed which is large at the bottom, and a layer of dried sulphate of iron be laid on the surface of the mercury, the operation becomes easy and regular. Care must be taken, before introduction into the retort, to heat the sulphate of iron until it is reduced to a white powder; as, without this precaution, the water of crystallization, which is distilled over before the mercury, will hang on the sides of the tube, and expose it to the danger of being broken.—[*Bulletin de la Société d'Encouragement.*]

ON THE METHOD OF EMPLOYING ZINC-WHITE AS A SUBSTITUTE FOR WHITE-LEAD.

It has been proved that zinc-white may be employed, with great advantage, as a substitute for white-lead, for painting and other purposes for which that substance is ordinarily employed; as the former substance is free from the disadvantages possessed by the latter, which is not only liable to turn black by the action of the air, but also produces the painter's cholic, and other disorders, which are often fatal. Zinc-white is, moreover, found to be unchangeable; this fact has been proved, beyond dispute, by numerous well-verified experiments; but the principal obstacle to its employment has been the difficulty of working with that material. This arises mainly from the fact, that workmen, who are accustomed to a certain routine practice, are at fault when a new substance is set before them; and, after attempting to use it according to the method with which they are acquainted, and not finding it succeed, they immediately condemn it as useless. Although persuaded of the beneficial results which would accrue from the use of zinc-white, the masters will not take the trouble to look into the matter themselves, but rely upon their workmen; and thus the public are persuaded that the application is impracticable. Now, it is the object of the present paper to obviate this difficulty, by pointing out the method of employing zinc-white with success and economy.

The first thing to be done is, to procure oil as nearly white as possible; this is essential, if a bright color be required, for, as the zinc-white possesses less body than white-lead, colored oil imparts a color to it, which tarnishes its brightness; if, however, a yellow color be required, there is no occasion to be so particular about the whiteness of the oil. The most suitable oil, and which is

generally sufficiently white, is the oil of the black poppy, which may be procured from Flanders and Alsace, where it is in common use;—in default of obtaining this, any other siccative oil, provided it be white, will answer the purpose, although it may, perhaps, smell a little stronger.

The zinc-white is to be ground, while dry, into powder, with a mullet; it must then be scraped, with a painter's knife, into a heap, in the middle of which a hollow is to be made, to receive a small quantity of oil; the whole is then to be mixed with a knife, so as to bring it to the consistency of very thick mortar or paste, and rather dry than otherwise,—as this substance becomes more liquid the more it is ground. This paste is then placed on a separate palette, from which a small quantity is taken and put under the mullet, and triturated; and, as the color escapes, it is scraped up with the knife, and placed in heaps on a clear space on the stone, where it is again ground,—the mullet being carefully placed in the centre of the heaps: when, by this means, the color is spread over the whole surface of the stone, three or four turns from one end to the other will finish the grinding; the whole must then be scraped off with a knife. This operation, which appears, at first sight, tedious and troublesome, soon becomes easy of performance,—as zinc-white has a fine and easily separated grain, which, consequently, requires but little grinding. Care must be taken that the color is of sufficient consistence to be laid on a flat surface without shewing through; and, consequently, if it be too liquid, it will be necessary to add a sufficient quantity of powder to give it the required consistency, and again grind it; it is then to be put in a clean vessel containing clear water. In this state it may be mixed with any of the ordinary colors, and will be found to make up with any of the colors usually combined with white-lead, producing a fresher tint than when the latter substance is used.

The natural color of zinc-white is a milk-white, less bright than that of white-lead of the best quality, which inclines to blue, but much superior to that of common white-lead or ceruse; and, therefore, zinc-white may be said to be the medium quality between "kremnitz" and the common white-lead or ceruse generally employed for painting the interior of apartments. Zinc-white may therefore be considered as an efficient substitute for white-lead, without possessing any of its disadvantages.

Paints having zinc-white as their base, do not dry so quickly as lead colors, but they will set more quickly than ochre: the difference in time, as compared with white-lead, is about 2 to 5; and, if it be ground up with oil which is rather old, and not very oleaginous, it will dry as quickly as white-lead.* When mixed with substances which do not dry easily, it will only be necessary to add, as a siccative, a little white copperas (sulphate of zinc); care being taken not to use the oil prepared with lead, usually employed by painters, as it would not only turn the white

* By the addition of siccative oil, colors, made with zinc-white, will dry as quickly as ceruse.

yellow, but would impart to it the deleterious qualities sought to be avoided by its use; if, however, it is found necessary to use this oil for black or other colors which will not dry, it must be used with caution.

When large surfaces are to be painted, the brushes used must be very soft and not too close, in order that the color may be laid equally; and, if the first coat be properly laid on, the laying of the second will be unattended with difficulty.

Experience has shewn, that about $2\frac{1}{2}$ ounces of zinc-white are sufficient to cover a square yard; while from $4\frac{1}{2}$ to 5 ounces of white-lead, of second quality, are required for this purpose; at the same time, supposing it to be more expensive, this is amply compensated by the certainty that it will not prove injurious, either to those employed in painting, or persons inhabiting apartments painted with it.—[*Ibid.*]

ON THE PROPORTION OF WATER AND LIGNEOUS MATTER CONTAINED IN CORN AND ITS PRINCIPAL PRODUCTS.

BY M. E. MILLON.

The author states that water and ligneous matter contained in grain represent nearly the whole of the inert matters, or those parts which do not assimilate to any parts of the human body; and, therefore, by ascertaining the proportion of these two principles, the true quantity of aliment contained in corn, flour, bread, and bran, may be ascertained.

This important operation has never been performed according to a uniform and properly regulated method,—and the consequence is, that to arrive at a correct estimate of the quality of grain or its products, from the quantity of water and ligneous matter contained therein, considerable difficulty and uncertainty are experienced, and thus questions of the greatest importance as regards health and economy, are left undecided.

The cortical covering of the grain of corn is composed of ligneous matter, to which the other similar principles adhere with such tenacity that they cannot be separated by any mechanical means. The bran, which it is intended to reject, always carries off a portion of amylaceous matter, which whitens one face of the pellicle, and which is partially separated by simply washing with cold water. As the ligneous matter is indigestible, and is therefore thrown aside, the nutritious matter adhering thereto is sacrificed. The quantity of bran thus separated amounts to from 10 to 25 per cent. of the weight of the raw flour. This elimination of the bran, technically called bolting, causes considerable loss, as the bran is comparatively valueless, it being only fit for little else than feeding cattle. It follows that the more the flour is bolted the more valuable it becomes, and the price of the bread made from it increases proportionably. It will therefore be understood, that when economy is an object, it is desirable to bolt the flour at as cheap a rate as possible. Thus, for military purposes, the flour of soft or new corn is bolted to the extent of 15 per cent., and old or hard corn 5 per cent.

In some places bread, of inferior quality, is made from flour which is subjected to a moderate degree of bolting. Great care and attention is, however, requisite to carry on the bolting operation to the desired degree; but, when performed, how is it possible to discover from manufactured bread the quantity of bran really extracted from the raw flour? Besides, different kinds of flour contain such different proportions of bran, that, in one instance, a bolting to the extent of 10 per cent. will leave more bran in the flour than 5 per cent. in another.

In seeking to solve these questions, M. Millon states, that he has discovered that the quantity of ligneous matter contained in corn has been greatly exaggerated. According to the general idea hitherto adopted by millers, so large a quantity of cellulose matter, injurious to food, is contained in raw flour, that it ought, at any rate, to be removed. But, on referring to facts, no sufficient authority is found for this.

M. Millon says, that M. Boussingault's excellent work is the only one in which he has found a correct account of the quantity of ligneous matter; he says it is 7·5 per cent. It is true, various contradictory statements have been made, but these have no weight against M. Boussingault; nor do they seem to be established in the scientific world. After having carefully studied all the known methods for ascertaining the quantity of ligneous matter, and made various experiments, M. Millon says, that he has never found more than from 8 to 10 per cent. On making an analysis of the refuse matters, in order to determine their constituent parts, he found the quantity of azote determined by M. Boussingault to be correct. He also found that it contained gluten in large quantity, as he extracted it pure by means of acetic acid.

M. Millon concludes, from his analysis, that bran is decidedly very nutritious; and is of opinion, that the most economical and desirable mode would be again to grind the bran, &c., and mix it with the flour:—he says he has found that bread thus made was of superior quality, and was much better than the bread made from raw flour, as is the practice in Belgium and other places.—[*Comptes Rendus.*]

MODE OF EXTINGUISHING FIRES IN COAL MINES.

For the following interesting account of the successful result of an experiment made to extinguish a fire in the coal mine of Mr. Darlington, at Astley Collieries, near Manchester, we are indebted to the *Times*. Mr. Darlington, who is the author of the communication, writes as follows:—

"On Monday, the 2nd of April, one of my coal mines, at Astley, was discovered to be on fire, and had spread to such an alarming extent as to prevent all access by the usual shafts. We immediately put out all the fires about the works, and requested the cottagers in the neighbourhood to do the same, for fear of an explosion. The plan of procedure in such cases (which happen more frequently than those unacquainted with collieries suppose) is, first to stop

down all openings into the mine, so as to prevent any access of the atmosphere. If, after some time, the fire is found not extinguished, the only alternative is to fill the mine with water from some source in the neighbourhood. In the absence of a sufficient reservoir of water, the pumps are stopped, and the water allowed to accumulate from the natural drainings, generally an unsatisfactory and slow process. In the former plan, notwithstanding every precaution is taken in sealing the shafts, it is found by experience that air in small quantities will be drawn through the stoppings and fissures of the earth sufficient to keep up a slow rate of combustion for a very long period. We have proof of this in many instances occurring in this neighbourhood. In the extensive collieries worked by Lord Bradford, at Bolton, the mine has been on fire nearly two years. When the fire happened, it was sealed up for some months; but, on opening it, the fire was found still burning. The pits were again immediately sealed up, and left to remain for twice the former period. On opening the mine at this time the fire burst out as before. It was again closed, and so remains to this day. At the collieries of the Earl of Ellesmere, at Worsley, one of the mines took fire about the same time; it was treated in the same way; it is still on fire; and, at this moment, his lordship is about to turn in the Bridgewater Canal. In the Patricroft Colliery, the deepest mine in this county, a fire broke out in the upper part of the workings, which baffled every attempt to extinguish it, and is now stopped up and abandoned. At Mr. Blundell's colliery, at Blackrod, in this district, the pits were opened after being closed some weeks, on account of fire, when a fearful explosion took place, and did considerable mischief to the workings. The fire burned with greater intensity than ever: the flames rose out of the mines, set fire to the head-gear, and burned so fiercely within the pit that it actually melted the iron tram-wheels. In this case the River Douglas was eventually turned into the workings so as to fill them with water. I could mention several other cases in this immediate neighbourhood, to shew the importance of the question before us, and the difficulties we have to contend with when these unfortunate accidents occur. In our case we instantly sealed up the mine, yet fire-damp issued from every crevice about the stoppings, and through orifices in the earth, in such quantities that the safety lamps would take fire at a considerable distance. In this state of things I wrote to Mr. Goldsworthy Gurney (whose application of high-pressure steam to the ventilation of coal mines is exciting so much interest), stating the case, and asking if he could point out any plan, by high-pressure steam exhaustion, or otherwise, likely to be of service. Mr. Gurney immediately came down, and after well investigating the conditions, in consultation with us, proposed to fill the mine with carbonic acid, azote, or some other extinguishing and incombustible gas. This, at first, appeared to us impracticable,—the immense quantity required to fill the galleries and lateral workings, together above three miles in length, being too expensive, if it were possible to obtain it,

to warrant the proposition. He, however, soon set us right. He said nitrogen, or azote, might be obtained from the winds of Heaven, and carbonic acid from the coals lying waste about the pit, assisted by a little charcoal and lime; air would be deprived of its oxygen by being passed through burning charcoal, coal, coke, and small coal, and the azote set free. In short, the product of this combustion would be the choke, or black damp known in mines. We immediately built a furnace of brickwork four feet square, at a safe distance from the downcast shaft. To the ash-pit, in every other respect made tight, an iron cylinder thirteen inches in diameter was connected, and made to terminate at an elbow under water in a close tank partly filled. With the upper part of this tank, above water, another pipe was connected and carried through the stopping of the downcast pit. A powerful steam jet was made to work between the furnace and the tank, which drew the air down through the fire, and forced it through the water. A second jet was placed in the cylinder at the top of the downcast shaft, and made to draw the choke-damp from the tank, and force it into the pit. At the other, or upcast shaft, we placed a jet in a cylinder, communicating, through the stopping, with the mine, for the purpose of exhausting the shaft beneath and thereby assisting the compressing jets to drive the choke-damp through the galleries. The apparatus thus fitted, as soon as the fire in the furnace had burned up, was set in action. In order to test the effect of the choke-damp, we placed some burning tow, moistened with spirits of turpentine, into it. The flame was as instantly extinguished as if it had been placed in water. It was thus tested in the cylinder, as it passed from the ash-pit, before coming to the jet, and also in the tank and second cylinder, with similar results. This was conclusive evidence of the perfect formation of the choke-damp. In about two hours after the jets were set in action, fire-damp disappeared from the shafts, and we observed a slight cloudy appearance in the escapage from the upcast shaft. It had the sulphurous smell of choke-damp, which pervaded the air to a considerable distance. A safety lamp was now brought and placed in the upcast cylinder; it became instantly extinguished as if put into water. For this purpose the draughts were momentarily shut off. A bright burning fire of charcoal, in a chafing dish, was placed in the escapage at the cylinder, and was also immediately extinguished. These facts satisfied us that the choke-damp had passed through the mine. The period of its appearance agreed with our calculations. The quantity of choke-damp forced through the mine was about 6,000 cubic feet per minute, and this would fill the galleries in about that time. The choke-damp was allowed to remain for several hours, at the termination of which we were convinced that all fire, however intense, must be extinguished in the mine. The connection with the furnace was now broken, and fresh air driven through by the same jets. In about two hours the choke-damp disappeared; this was shewn by a safety lamp burning clearly in the escapage in the cylinder at the upcast shaft. We regarded the mine now

as perfectly safe. With several men I descended the downcast shaft, 390 feet deep, to the tunnel leading to the working. We found all clear: the exhausting jet was kept up, drawing fresh air through the mine all night. The next day several men went down, and passed through the workings, and found all clear and safe. Their report was particularly favourable. In no part of the mine could they perceive any fire, and the action of the single jet in the upcast is described by them as passing a current with greater speed than the furnace (which is pronounced to be the most effectual one in the county) had ever before done in this or any other of the mines of which I am the proprietor. This result has occasioned the greatest interest in our neighbourhood. Never was an experiment more successful. A gigantic power under such complete control, fighting with the elements, and, as it were, compelling them to destroy each other. The application of high-pressure steam to the ventilation of coal mines may effect a greater protection to life and property, but we regard this application as little inferior to the coal trade, and a triumph of science equal to any of the present day.

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1849.

April 27. *Samuel Fox*, of Gracechurch-street, London, for the telescopic pencil or pen-holder.

28. *William Breynton*, of Norfolk-street, Strand, London, for a portable oven.

28. *Michael Hewan Crighton*, of 63, North-bridge, Edinburgh, for an apparatus for securely holding brooches.

28. *McAdam Brothers & Co.*, of Soho Foundry, Belfast, Ireland, for an improved beater or scutcher for dressing flax and other fibrous plants from the straw, and separating the fibre from the woody part.

28. *Robert Leslie*, of 39, North Frederick-street, Edinburgh, for a cutting machine.

30. *James Grafftey*, of 7, Sydney-alley, Coventry-street, London, for a fastening for shirt collars, garments, &c.

30. *Meyer, Joseph, and Meyer*, of 21 and 24, Bow-lane, Cheapside, umbrella and parasol manufacturers, for the "parasol Parisienne."

May 2. *James Watson Blackburn*, of the Family Under Clothing Warehouse, 47, Cheapside, London, for the "zététique prize shirt."

2. *Joseph Guise*, of 75, Margaret-street, Wilmington-square, for an improved gas-burner and glass-holder.

2. *Thomas Hutchins Pinder*, of 117, High-street, Cheltenham, for the combined coat and waistcoat.

May 3. *Thomas Stucley*, of 29, Turner-street, Commercial-road East, for a loo table.

4. *William & Henry Hutchinson*, of Sheffield, for a dilator for syringe.

5. *Marius Pierre Philip Bourjeaurd*, of Davies-street, Berkeley-square, surgeon, for the elastic pessary (surgical instrument).

8. *Edward Simons*, of Birmingham, for a fastening for trouser-straps and other articles of dress, &c.

10. *Simon A Kisch*, of 2, Maddox-street, Regent-street, for the "auto-crematic gown."

11. *Richard Waygood*, of 56½, Newington-causeway, agricultural instrument maker, for a corn and flour grinding and dressing-mill.

11. *John Davis Waymouth*, of Nailsen, near Bristol, for an improved terrestrial globe.

12. *David Harcourt*, of Bristol-street, Birmingham, machinist, for an egg-blender.

14. *John Bourne*, of 11, Savage-gardens, London, for an improved steamer.

15. *William Bishop*, of Boston, Lincolnshire, for a metallic box-end protector.

15. *Henry Knight*, of Birmingham, mechanical engineer, for an improved steam-engine indicator.

16. *John James*, of 14, John-street, Oxford-street, Middlesex, for a railway travelling trunk, with collapsible hat or bonnet case attached, generally applicable as a hat or bonnet case.

16. *Thomas Buckland*, of Islington, for a cigarilla.

16. *John Roberts*, of 34, Eastcheap, in the City of London, spice-merchant, for a grape-tile.

16. *Charles Fletcher & Co.*, of Birmingham, for a cylinder for brick-making machine.

17. *Henry Rowe Stevens*, of Newmarket, for a smoke-diffuser, to cure smoky chimneys.

22. *William Parkins*, of 25, Oxford-street, for a doubly-secure despatch envelope.

22. *Thomas Suttie*, of Cathcart-street, Greenock, smith, for a kitchen boiler.

24. *Benjamin Levy*, of 324, and 325, High Holborn, Middlesex, for "The Prince" (an over-coat).

24. *William & George Ashford*, of Birmingham, whip-makers, for an improved holder for whip-sticks and other similar articles.

24. *John Pannell*, of Cowley, Middlesex, agricultural and horticultural engineer, for the "calorifere," for greenhouses and conservatories, &c.

25. *William Blackmore Pine*, of the Strand, London, for the "mimosa or flower-cornet."

May 25. *Wood & Co.*, of the Grove, Southwark, for the "cigar lip-guard."

25. *Douglas Hebson*, of No. 1, Dale-street, Liverpool, for an improved form of rudder-casing and rudder for vessels which are intended to be steered at each end.

List of Patents

That have passed the Great Seal of IRELAND, from the 20th April to the 20th May, 1849, *inclusive.*

To Stephen White, of Victoria-place, Bury New-road, Manchester, in the county of Lancaster, gas engineer, for improvements in the manufacture of gases, and in the application thereof to the purposes of heating and consuming smoke; also improvements in furnaces for economizing heat, and in apparatus for the consumption of gases.—Sealed 19th April.

Felix Alexander Testud de Beauregard, of No. 17, Rue St. Quentin, Paris, engineer, for improvements in generating steam, and in the means of obtaining power from steam-engines.—Sealed 27th April.

Thomas John Knowlys, of Heysham Tower, near Lancaster, and William Fillis, of Shirley, in the county of Hants, mechanician, for improvements in generating, indicating, and applying heat. —Sealed 10th May.

Samuel Brown, the younger, of Lambeth, in the county of Surrey, engineer, for improved apparatuses for measuring and registering the flow of liquids and substances in a running state; which apparatuses are in part also applicable to motive purposes.—Sealed 15th May.

John Smith, of Hare Craig, Dundee, N. B., factor to Lord Douglas, of Douglas, for improvements in the manufacture of flour, applicable in the making of bread, biscuit, and pastry.—Sealed 18th May.

List of Patents

Granted for SCOTLAND, subsequent to April 22nd, 1849.

To Meyer Jacobs, of Spitalfields, London, for certain improvements in the manufacture, stamping, and treatment generally of woven fabrics of all kinds.—Sealed 25th April.

James Roose, of Darlaston, Staffordshire, tube manufacturer, and William Haden Richardson, the younger, of the same place, tube manufacturer, for improvements in the manufacture of tubing.—Sealed 30th April.

Robert Oxland, of Plymouth, chemist, and John Oxland, of the

same place, chemist, for improvements in the manufacture of sugar.—Sealed 4th May.

Frederick Steiner, of Hyndburn, near Accrington, county of Lancaster, Turkey-red dyer, for improved processes and apparatus to be used in the Turkey-red dye on cotton and its fabrics.—Sealed 7th May.

John Dalton, of Hollingworth, county of Chester, calico printer, for a certain improvement or certain improvements in printing calicoes and other surfaces.—Sealed 9th May.

Alexander Munkittrick, of Manchester, merchant, for an improved composition of matter, which is applicable as a substitute for oil to the lubrication of machinery, and for other purposes.—Sealed 10th May.

James Anderson, of Abbotsford-place, Glasgow, starch manufacturer, for a certain improved mode of separating different qualities of potatoes and other vegetables.—Sealed 11th May.

Alexander Swan, of Kirkcaldy, Fifeshire, for improvements in heating apparatus, and in applying hot and warm air to manufacturing and other purposes, where the same are required.—Sealed 14th May.

Samuel Adams, of West Bromwich, Staffordshire, organist, for improvements in mills for grinding.—Sealed 16th May.

Alphonse Garnier, of Paris, but now of South-street, Finsbury, London, merchant, for certain improvements in extracting and preparing coloring matter from orchil,—being a communication.—Sealed 21st May.

Rees Reece, of St. John-street, Smithfield, and Astley Paston Price, of Margate, chemists, for improvements in the manufacture and refining of sugar or saccharine matters.—Sealed 21st May.

Daniel Miller, of St. George's-road, Glasgow, civil engineer, for certain improvements in the mode of drawing ships up an inclined plane out of water; for which mode a patent was granted to the late Thomas Mortin, of Leith, ship-builder, on the 23rd March, 1819, and which mode has been commonly known as Mortin's slip.—Sealed 21st May.

New Patents
SEALED IN ENGLAND.
1849.

To James Wilson, of Old Bond-street, tailor, for improvements in trusses. Sealed 1st May—6 months for inrolment.

James Godfrey Wilson, of Millman's-row, Chelsea, engineer, for certain improvements in the manufacturing of glass, and in machinery and apparatus connected therewith. Sealed 1st May—6 months for inrolment.

Alexander Munkittrick, of Manchester, merchant, for an improved composition of matter which is applicable as a substitute for oil to the lubrication of machinery, and for other purposes,—being a communication. Sealed 1st May—6 months for inrolment.

John Dalton, of Hollingworth, county of Chester, calico printer, for a certain improvement or certain improvements in printing calicoes and other surfaces. Sealed 1st May—6 months for inrolment.

Samson Woller, of Bradford, manufacturer, for certain improvements in machinery or apparatus for weaving. Sealed 3rd May—6 months for inrolment.

Thomas Wentworth Buller, of Sussex-gardens, Hyde-park, Esq., for improvements in the manufacture of earthenware. Sealed 3rd May—6 months for inrolment.

Matthew Kennedy, of Manchester, cotton spinner, for certain improvements in the method of packing "cops" of cotton and other fibrous materials, and in the apparatus connected therewith. Sealed 3rd May—6 months for inrolment.

Thomas Whaley, of Chorley, Lancashire, coal proprietor, and Richard Ashton Lightoller, of the same place, cotton spinner, for certain improvements in machinery or apparatus for manufacturing bricks and tiles from clay or other plastic materials. Sealed 3rd May—6 months for inrolment.

William Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in the Jacquard machine,—being a communication. Sealed 5th May—6 months for inrolment.

George Edmond Donisthorpe and John Whitehead, of Leeds, manufacturers, for improvements in preparing, combing, and hackling fibrous matters. Sealed 8th May—6 months for inrolment.

Samuel Wilkes, of Wednesfield-heath, Wolverhampton, brass-founder, for improvements in the manufacture of knobs, handles, and spindles for the same, for doors and other purposes; and improvements in locks. Sealed 8th May—6 months for inrolment.

Robert Sutcliffe, of Idle, near Bradford, in the county of York, cotton spinner, for improvements in machinery for spinning cotton, silk, and other fibrous substances. Sealed 8th May—6 months for inrolment.

George Henry Dodge, of Manchester, manufacturer, for certain improvements in machinery for spinning and doubling cotton yarns and other fibrous materials, and in machinery or apparatus for winding, reeling, balling, and spooling such substances when spun. Sealed 10th May—6 months for inrolment.

Charlotte Smith, wife of Jabez Smith, of Bedford, for improve-

ments in certain articles of wearing apparel. Sealed 14th May—6 months for inrolment.

Samuel Allport, of Birmingham, gun-maker, for a certain improved method of making or manufacturing a certain part or parts of looms used in weaving. Sealed 14th May—6 months for inrolment.

William Phillips Parker, of Lime-street, in the City of London, Gent., for improvements in the construction of piano-fortes,—being a communication. Sealed 15th May—6 months for inrolment.

John Thom, of Ardwick, near Manchester, calico printer, for improvements in cleansing, scouring, or bleaching silk, woollen, cotton, and other woven fabrics and yarns, and in ageing fabrics and yarns when printed. Sealed 15th May—6 months for inrolment.

John Sharp Cromartie Heywood, of Islington, for improvements in expressing and treating oils, and in the manufacture of varnishes, pigments, and paints. Sealed 15th May—6 months for inrolment.

Moses Poole, of the Patent Bill Office, London, Gent., for improvements in apparatus for drawing fluids from the human or animal body,—being a communication. Sealed 15th May—6 months for inrolment.

Louis Alfred De Chatauvillard, of Rue St. Lazare, in the Republic of France, Gent., for improvements in fire-arms, cartridges, bullets, bayonets, and ordnance,—being a communication. Sealed 15th May—6 months for inrolment.

Pierre Armand Le Comte De Fontainemoreau, of South-street, Finsbury, for certain improvements in weaving,—being a communication. Sealed 22nd May—6 months for inrolment.

Francis Edward Colegrave, of Brighton, Gent., for improvements in the means of communicating between the passengers and guard of a railway train, or between the guard and engine-driver; parts of which improvements are also applicable to working signals on railways. Sealed 22nd May—6 months for inrolment.

Solomon Israel Da Costa, of Great St. Helens, in the City of London, civil engineer, for improvements in vessels for holding solids or fluids, and in machinery for manufacturing such vessels. Sealed 22nd May—6 months for inrolment.

Rees Reece, of St. John-street, Smithfield, and Astley Paston Price, of Margate, chemists, for improvements in the manufacture and refining of sugar or saccharine matters. Sealed 24th May—6 months for inrolment.

Andrew Crosse, of Gloucester-place, New-road, Middlesex, Esq., for improvements in tanning hides and skins; and also in dyeing fabrics and substances. Sealed 24th May—6 months for inrolment.

Thomas Goodfellow, of Tunstall, in the county of Stafford, earthenware manufacturer, and George Goodfellow, of Shelton, in the same county, potter, for improvements in the method or methods of preparing plastic materials for manufacturing purposes. Sealed 24th May—6 months for inrolment.

Andrew Smith, of St. James's, in the city of Westminster, engineer, for improvements in machinery for, or methods of, manufacturing rope or cordage, and improved modes of fitting and using the same. Sealed 24th May—6 months for inrolment.

Frederick Steiner, of Hyndburn, near Accrington, in the county of Lancaster, Turkey-red dyer, for improved processes and apparatus to be used in the Turkey-red dye on cotton and its fabrics. Sealed 24th May—6 months for inrolment.

David Smith, of the City of New York, lead manufacturer, for certain new and useful improvements in the means of manufacturing certain articles in lead. Sealed 29th May—6 months for inrolment.

Richard Edward Hodges, of Bycroft, in the county of Hereford, Gent., for improvements in mechanical purchases, which are also applicable in whole or in part to projectiles. Sealed 29th May—6 months for inrolment.

Edmund Grundy, of Bury, in the county of Lancaster, woollen manufacturer, and Jacob Farrow, of the same place, manager, for certain improvements in machinery or apparatus for preparing wool for spinning, and also improvements in machinery or apparatus for spinning wool and other fibrous substances. Sealed 29th May—6 months for inrolment.

Disclaimers and Amendments
OF PARTS OF INVENTIONS
MADE UNDER LORD BROUGHAM'S ACT.

Disclaimer and memorandum of alteration, filed the 4th of May, 1849, with the Clerk of the Patents for England, to the specification of a patent granted to John Anthony Tielens, of Fenchurch-street, merchant, for "improvements in machinery or apparatus for knitting;" bearing date 7th April, 1842.

Disclaimer, filed on the 4th day of May, 1849, with the Clerk of the Patents for England, to the specification of a patent granted to Charles Iles, of Birmingham, machinist, for "improvements in the manufacture of certain descriptions of dress-fastenings, and in the making up of dress-fastenings and other articles for sale;" bearing date 4th November, 1848.

CELESTIAL PHENOMENA FOR JUNE, 1849.

D.	H.	M.	
1			Clock after the ☉ 2m. 31s.
—			☽ rises 3h. 25m. A,
—			☽ passes mer. 9h. 3m. A.
—			☽ sets 2h. 8m. M.
	6	11	♀ stationary
2	11	52	♃'s third sat. will im.
3	6	54	☿ greatest elong. 23. 40. E.
4	7	50	♂ in Perihelion
5			Clock after the ☉ 1m. 53s.
—			☽ rises 7h. 31m. A.
—			☽ passes mer. Morn.
—			☽ sets 3h. 57m. M.
	10	27	Ecliptic oppo. or ○ full moon
	15		☽ in Apogee
10			Clock after the ☉ 0m. 57s.
—			☽ rises 11h. 11m. A.
—			☽ passes mer. 3h. 14m. M.
—			☽ sets 7h. 55m. M.
	10	31	♃'s second sat. will em.
11			Occul. e^2 Aquarii, im. 11h. 43m. em. 12h. 46m.
	6	30	☿ in the descending node
12			Occul. h^1 Aquarii, im. 14h. 57m. em. 15h. 15m.
13	9	31	♃'s first sat. will em.
	10	24	☽ in □ or last quarter
14	11	53	♄ in conj. with the ☽ diff. of dec. 0. 21. N.
	—		Mercury R. A. 6h. 56m. dec. 22. 8. N.
	—		Venus R. A. 2h. 56m. dec. 13. 55. N.
	—		Mars R. A. 1h. 17m. dec. 6. 28. N.
	—		Vesta R. A. 4h. 26m. dec. 18. 13. N.
	—		Juno R. A. 8h. 22m. dec. 14. 2. N.
	—		Pallas R. A. 17h. 50m. dec. 24. 38. N.
	—		Ceres R. A. 18h. 42m. dec. 26. 47. S.
	—		Jupiter R. A. 9h. 25m. dec. 16. 6. N.
	—		Saturn R. A. 0h. 29m. dec. 0. 40. N.
	—		Georg. R. A. 1h. 35m. dec. 9. 17. N.
	—		Mercury passes mer. 1h. 25m.
	—		Venus passes mer. 21h. 24m.
	—		Mars passes mer. 19h. 45m.

D.	H.	M.	
14			Jupiter passes mer. 3h. 54m.
	—		Saturn passes mer. 18h. 55m.
	—		Georg. passes mer. 20h. 1m.
15			Clock before the ☉ 0m. 4s.
	—		☽ rises 0h. 59m. M.
	—		☽ passes mer. 7h. 11m. M.
	—		☽ sets 1h. 35m. M.
	11	52	♂ in conj. with the ☽ diff. of dec. 2. 8. N.
	18	2	♅ in conj. with the ☽ diff. of dec. 3. 26. N.
	—		Occul. υ Piscium, im. 15h. 48m. em. 16h. 47m.
16	11	51	☿ stationary
	21	23	Pallas oppo. ☉ intens. of light 0·374
17			Occul. ƒ Tauri, im. 14h. 1m. em. 16h. 45m.
19	17		☽ in Perigee
20			Clock before the ☉ 1m. 9s.
	—		☽ rises 4h. 0m. M.
	—		☽ passes mer. 11h. 55m. M.
	—		☽ sets 7h. 54m. M.
	2	19	Ecliptic conj. or ● new moon
	19	8	♂ in conj. with ♅ diff. of dec. 1. 4. S.
21	0	9	☿ in conj. with the ☽ diff. of dec. 1. 26. N.
	2	8	☉ enters Cancer. Summer com.
	10	15	☿ in Aphelion
23	14	27	♃ in conj. with the ☽ diff. of dec. 2. 15. N.
24			Occul. 44 Leonis im. 10h. 51m. em. 11h. 39m.
25			Clock before the ☉ 2m. 14s.
	—		☽ rises 9h. 49m. M.
	—		☽ passes mer. 4h. 43m. A.
	—		☽ sets 11h. 25m. M.
27	10	44	☽ in □ or first quarter
	22	56	Ceres oppo. to the ☉ intens. of light 0·812
	—		Occul. 38 Virginis, im. 10h. 0m. em 10h. 45m.
29	2	16	♄ in □ with the ☉
	19	23	☿ in inf. conj. with the ☉
30			Clock before the ☉ 3m. 16s.
	—		☽ rises 3h. 33m. A.
	—		☽ passes mer. 8h. 30m. A.
	—		☽ sets 1h. 3m. M.
	4	43	♀ in Aphelion
	16	0	☉ in Apogee

J. LEWTHWAITE, Rotherhithe.

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No. CCXI.

RECENT PATENTS.

To WILLIAM EDWARD NEWTON, *of the Office for Patents,* 66, *Chancery-lane, in the county of Middlesex, civil engineer, for an invention of certain improvements in machinery for letter-press printing,—being a communication.*—[Sealed 18th July, 1848.]

THESE improvements in machinery for letter-press printing, which are the invention of Mr. Hoe, of New York, relate, in the first place, to various improvements on a former patent, obtained in the name of William Newton on behalf of the same inventor, and bearing date 4th May, 1847.

The first head of the present invention consists, firstly, in various modes of giving to each set of inking-rollers an equal quantity of ink, and in dispensing, if required, with the use of the distributing surface on the large cylinder, and also the stationary inking apparatus, and in employing, in place thereof, what the inventor calls—a revolving ink-fountain; secondly, in a novel arrangement of apparatus, whereby the sheet may be printed on both sides by the same impression-cylinder before it is delivered from the machine.

In Plate XVI., fig. 1, represents a partial side elevation of a printing machine, with some of the improvements applied thereto; and fig. 2, is an end elevation of the same. A, A, are the side frames; B, is the main or type-cylinder; C, is the form of type; D, is the ink-fountain; E, is a metal distributor, which revolves in contact with the fountain-roller, but in a contrary direction, and is adjusted by set-screws.

operating on its bearings, and is driven from a pinion on the driving-shaft; *a*, is a small vibrating service-roller, covered with composition or cloth, and is always kept in contact and revolves with the metal distributor E; *b*, *b*, is a similar roller, for the purpose of aiding the distribution of the ink; F, is the distributing surface; *c*, *c*, are composition rollers; and *e*, is a sliding-bar, with a friction-roller on its inner end. *f*, is another sliding-bar, for carrying the service-roller *a*. A cam-wheel *g*, consisting of a series of cams, is mounted on the main shaft of the type-cylinder, and acts against the friction-rollers on the inner ends of the sliding-bars *e*, and *f*, which are kept pressed against the cam-wheel by means of the springs *h*, *h*, as shewn in fig. 1. The part of the cam-wheel *g*, against which the friction-roller of the sliding-bar *f*, works, is shaped so as to press the service-roller *a*, outwards, and allow the form of type to pass under without touching it; but, immediately the form has passed, the cam-wheel allows the service-roller *a*, to spring towards the distributing surface, where it remains until the service-roller has made, say two revolutions. This puts ink on a part of the distributing surface equal to twice the circumference of the roller *a*; it is then pressed out and held until the form has again passed, when it springs back to the distributing surface and furnishes another supply. The cam of the wheel *g*, that moves the first pair of inking-rollers, is of such form, in a four-cylinder machine, as to allow the inking-rollers (after the form has passed) to draw in and take the ink from the last quarter part, or thereabouts, of the space of the distributing surface inked by the service-roller *a*; which ink the rollers distribute over the remainder of the distributing surface; after which, the cam presses the inking-rollers out again to give this ink to the form as it passes under them. The cam-wheel *g*, then allows the next pair of inking-rollers to spring in, so as to take ink from about the next quarter of the inked part of the distributing surface; which ink these rollers also distribute on the remainder of the surface; and then are forced outwards, and furnish ink to the form as before. The third set of rollers take the ink from the third quarter of the inked part of the distributing surface; and the fourth set act against the fourth and last quarter, and distribute and ink the form in like manner. Thus each set of inking-rollers gets an equal quantity of ink.

Another method of effecting the same object is as follows:— The bearings of the service-roller *a*, are made stationary, as shewn in fig. 3; and two narrow segments of the distributing

surface *i, j,* are made to slide in and out by means of the levers *k,* to one end of which they are jointed. On the other ends of these levers are the friction-rollers *l, l,* which, as the type-cylinder revolves, strike against cams on the side frame. These cams are so shaped as to throw the segments *i, j,* out sufficiently far to touch the service-roller *a,* and receive from it a supply of ink; and they are drawn back by the spiral springs *o, o.* One of these segments *i,* is thrown out as it passes the first set of inking-rollers, and imparts to them about half the ink from its surface; it is drawn back as it passes the impression-cylinder; is again thrown out to give the rest of its ink to the next set of inking-rollers; and is again drawn back, and there remains until it arrives at the service-roller *a*; when it is again thrown out, and brought into contact with this roller, and thereby receives a fresh supply of ink. The other segment *j,* is thrown out to the other two sets of inking-rollers in the same manner; and thus each set of inking-rollers gets the same quantity of ink.

By placing the inking-rollers against small distributors and employing a revolving fountain G, attached to the periphery of the type-cylinder B, just behind the forms or form of type C, the distributing surface may be dispensed with. On one end of the fountain-roller is fixed a ratchet b^1; and to a support c^1, which is secured to one of the rings of the type-cylinder B, the arm or inclined plane d^1, is jointed. This inclined plane carries a pall e^1, the pointed end of which lies against one of the teeth of the ratchet b^1; the inclined plane is moved, as the cylinder revolves, by its point striking and passing the studs f^1, f^1, which are fixed to one of the side frames, and project inwardly sufficiently far for that purpose; and thus the fountain-roller is turned a small distance, which brings the ink from the fountain on to the surface of the roller. One of these studs is placed between each set of inking-rollers g^1, g^1, and h^1, h^1; and the fountain-roller is so placed as to touch the inking-rollers as it passes them, and thus gives to each set of inking-rollers a supply of ink. The quantity of ink is regulated, as usual, by the ductor; and the fountain may be made as ordinary fountains, except that it is entirely enclosed, and the ink is supplied to it from the reservoir H, through the pipes i^1, into the centre of the main shaft, and from thence through the branched pipes j^1, into the fountain. In the pipe i^1, there is a cock k^1, by which the ink can be stopped at pleasure. There is a distributing-roller l^1, which lies partly between the inking-rollers g^1, g^1, and h^1, h^1, and touches them, and is driven from the large toothed

wheel L, through the intermediate pinion m^1, which gears into a pinion n^1, on the axis of the distributor l^1. This distributor is made to vibrate laterally in either of the following ways:—On one end of the distributing-roller shaft is a right and left-handed screw o^1, in which works the forked-piece p^1, as shewn in the detached view fig. 4: or it may be done by means of the lever q^1, figs. 1, and 2, one end of which works in the grooved cam r^1, on the main shaft, and the other in the grooved collar s^1, fixed on one end of the distributing-roller shaft. On the outside of this distributor is a composition roller t^1, which is kept pressed against the distributor by the set-screws u^1. The composition rollers are adjusted to the type by the thumb-nuts v^1; and the rollers g^1, g^1, are moved sideways by the thumb-screws y^1, y^1. The composition rollers h^1, h^1, are held sideways by thumb-screws at x^1. By this plan the distributing surface is dispensed with; the composition rollers do not move in and out; and the fountain-roller projects a little further out than the surface of the type, so as to touch the composition rollers, and is so placed on the main cylinder that, when it passes the impression-cylinders, it meets and enters the groove or cavity made in the cylinder for the fingers which hold the sheet of paper to be printed.

The fountain, shewn at fig. 5, is intended to be used with cylinders fed by tapes, in which there is no opening or groove for fingers. The fountain and manner of working it, the pipes, and other parts, are the same as above described, except that the fountain does not project out to the type, and on the fountain-roller lies a lifting-roller a^2, which is made to rise, touch, and give ink to each set of inking-rollers as it passes them, and draws in to receive a fresh supply of ink from the fountain-roller as it passes each of the impression-cylinders.

Another part of these improvements consists in putting two forms of type on the main cylinder, and returning the sheet, after one side has been printed, to the same impression-cylinder, for the purpose of printing its opposite side by the other form of types, and thereby perfecting the impression. The sheet of paper is fed, as usual, from the feeding-table L, to the impression-cylinder K, around which it passes, and receives an impression from the first form of type, and is held by tapes, and passes out over the tape-roller d^2, on to the tapes shewn by dotted lines. When the latter end of the sheet arrives from between the rollers c^2, and d^2, the roller e^2, is raised, and thus lifts that end of the sheet up to the roller j^2: the roller e^2, is raised by the arm f^2, and lever g^2.

To the lever g^2, is jointed one end of the connecting-rod h^2; the other end works in a cam on the inside of the wheel b^2. As the roller e^2, is driven by a belt or gearing in a contrary direction to the roller c^2, the end of the sheet of paper is arrested and its direction changed; and it passes up over the top of the roller c^2, on the tapes k^2, to the impression-cylinder; around which it again passes, and receives the impression on its opposite side, which is now presented to the other form of type, and continues out between the rollers c^2, and d^2, with the tapes, shewn by dotted lines. The roller e^2, having been drawn down by the action of the cam, rests there, and thereby allows the sheet to pass under the roller l^2, where the tapes s^2, around this roller and the roller m^2, seize and guide it over the pulleys n^2, and shoot it down over and in front of the light lath fly-frame R. When the sheet has just passed between the rollers and tapes, the fly-frame R, is thrown over by the point of the cam p^2, releasing the stud on the connecting-bar r^2, which is jointed to the short crank x^2, on the shaft t^2, of the fly-frame R. This allows the spring u^2, to act on the rod w^2, which, being jointed to the short arm v^2, on the shaft t^2, of the fly-frame, throws the fly-frame over. The sheet is held up against the light fly-frame, while being thrown over, by the action of the air, as the motion of the fly-frame is quick enough to cause a sufficient pressure against it from the air alone. A table or board S, is placed so that the frame will deposit the sheets upon it in a regular pile. As the cam p^2, revolves, it acts on the stud q^2, and, forcing out the connecting-bar r^2, brings the fly-frame R, up to its first position, thereby leaving the sheet of paper on the table or board S.

The patentee claims, 1st,—the arrangement of the metal distributing-roller and the fountain-roller, by which the ink is taken in small quantity and continuously from the fountain-roller. 2nd,—arranging and working the service-roller *a*, in such a manner as to supply ink on a part of the distributing surface in connection with the moving of the inking-rollers in and out, so that each set of inking-rollers shall take an equal quantity of ink. 3rd,—the moving segments for giving an equal quantity of ink to each pair of inking-rollers. 4th,—adapting an ink-fountain to the main type-cylinder, so that the fountain will rotate therewith and furnish a supply of ink to each set of inking-rollers. 5th,—the arrangement for feeding this revolving fountain from a reservoir by pipes, or feeding by an opening into the fountain itself. 6th,—the arrangement of the small distributing-rollers in

connection with the revolving fountain, by which the "distributing surface" is entirely dispensed with. 7th,—the arrangement of the revolving fountain with a small service-roller, as shewn in fig. 5. 8th,—the methods, above described, for supplying ink to each set of inking-rollers from one ink-fountain. 9th,—the arrangement for printing the sheet on both sides, by means of the same impression-cylinder, before leaving the machine; such impression-cylinders being made to revolve constantly in one direction. 10th,—the construction and arrangement of the sheet-flying frame and its appendages, and the adaptation of the same to machines where the impression is given by a cylinder.

The second part of the invention consists in an improvement on the hand printing press. Fig. 7, is a front elevation of the press; fig. 8, a section of the frame, at the dotted line fig. 7; fig. 9, a side elevation; fig. 10, a plan of the bar-handle and connecting-rod; and figs. 6, are front and side views of the standard and lever. A, A, is the frame; B, the bed; C, the platten; and D, D, the legs to support the frame. E, represents the ribs or ways for the bed to slide upon; F, the bar-handle; G, the connecting-rod; H, the standard; I, the lever; and K, the "rounce." *a, a,* are projecting pieces, forming part of the frame, and support the bearings of the rounce-shaft *b*; *c,* is the rounce-crank; *d, d,* are the guide-rods for the platten; *e, e,* are springs for holding it up; *f,* is the wedge for regulating the impression; *g,* is a wrought-iron cup, which rests on the wedge *f*; and *h,* is a steel die in the cup, in which the steel point *i,* of the standard H, rests. *j,* is a steel top-piece, bolted to the top of the frame, against which the top of the lever I, works; *k,* is a piece of steel, dovetailed into the lever I, which works in the top of the standard H; *l,* is the fulcrum of the bar-handle; *m,* the point where the connecting-rod G, is jointed to it; and *n,* is the steel point, which works in one of the countersunk places *o, o,* in the lever I. When it is desired to give an impression with this press, the workman seizes the bar-handle and draws it toward him,—the bar-handle or first lever being bent, as shewn at fig. 10. As he pulls it forward, it draws the connecting-rod G, with much the greatest velocity at the first part of its motion; and as the fulcrum *l,* and the points *m,* and *n,* approach nearer in line, the speed diminishes: as the motion decreases, the power exerted by the workman will necessarily increase in a proportionate ratio. It is also evident that the standard and lever, from the peculiar shape of the lever, form a toggle-joint, with a lever or arm extending

from one of them, for the purpose of getting an increased leverage. When the connecting-rod G, is drawn forward (its steel point *n*, being in one of the countersunk places in the end of the lever I,) the lever I, will be also drawn forward, and press down the standard H; the power increasing and the motion diminishing until the point *i*, of the standard, and the two points of bearing *k*, and *j*, of the lever, are almost in a line with each other, which, added to the leverage of the bar-handle and connecting-rod, makes a compound leverage and toggle-joint with great power.

The patentee claims, 1st,—the combination of the toggle-joint and lever. 2nd,—the combination of these two above-named with the bar-handle or lever and connecting-rod.

The third part of the invention relates to an apparatus to be used in conjunction with a hand-press, and denominated by the inventor a self-inking machine. It consists of a combination of mechanism, which, by the action of the workman in running the bed of a common hand letter-printing press in and out, takes and distributes the ink; and, while he is taking off the printed sheet of paper and putting on a white or plain one, causes the inking-roller to roll over and back, once or twice, as desired,—thereby inking the types on the bed of the press.

Fig. 11, is a plan view of the machine; fig. 12, an end elevation; and fig. 13, a front elevation of the same. A, A, are the side frames; B, is a cross brace, which connects the side frames together; C, the composition inking-roller; D, a large distributing and vibrating-roller; and F, the ink fountain, with its roller. E, and H, are two weights for driving the composition roller C, over the form of type; and I, is a counter-weight for bringing it back. G, is a large screw on one end of the shaft *c*, of the distributing-roller D, answering a double purpose; around it, in opposite directions, two cords *a*, and *b*, are wound, and one of their ends is made fast to it; so that, if either of the cords be drawn, it will unwind, and cause the roller to revolve, and at the same time wind up the other cord, and *vice versâ*. These cords *a*, and *b*, turn around the guide-pulleys in the piece *q*, in opposite directions, and are fastened to the ends of the bed of the press. From the piece *q*, a piece of hardened steel projects into the groove of the screw G, whereby the roller D, is caused to vibrate as it revolves. To the other end of the shaft *c*, one end of a cord *u*, is made fast, so that, according to the direction in which the roller D, revolves, the cord *u*, is wound up or unwound. The other end of this cord, after passing by the guide-pulley

m, the piece *r*, and around the friction-pulley in the piece *l*, is fastened to the two cords *v*, *v*. The other ends of these cords are attached, one to the end of one, and the other to the end of the other, of the levers *f*, *f*, for the purpose of drawing them down. These levers hang loosely on the shaft *h*, and to their other ends are fixed the weights E, and H. On this end of the levers, near the centre, are two lever palls *x*, *x*, (their outer ends being the longer and heavier); and on the shaft *h*, between the levers *f*, *f*, is a collar r^1. This collar has in its periphery a ratchet-shaped notch, and is fastened to the shaft *h*, by a set screw, so as to be adjustable; and in this notch, at certain times, the palls *x*, *x*, drop. There is also on the inner lever a projecting pin p^1, which, as the weight H, and its lever rises, strikes against a bevilled-shaped projection on the spring q^1, and presses it back, and passes by it, and at certain times rests on it. There is jointed to this spring q^1, a pall *y*, having a hooked end, which extends over the shaft *h*. On this shaft, under the pall *y*, is another notched collar s^1, (see fig. 11,) similar to the one r^1, before described; and, by the motion of the shaft *h*, its notch, at certain times, catches the hooked pall *y*, and draws it and the spring q^1, back;—thus removing the bevilled projection from under the pin p^1, and leaving the weight H, at liberty to descend. The palls *x*, *x*, are tripped out of the notch in the collar r^1, and the weights E, and H, are stopped, in the following manner:—The palls are of such shape, that when their short ends are in the notch, their long ends hang a little below the bottom of their respective levers; and, when pressed up even with the bottom of the lever, their short ends are out of the notch. Now, as a weight and lever descends with the pall in the notch, the long end of the pall, projecting below the lever, first strikes the tripping-piece *z*; but the weight still descends until the lever strikes the piece *z*; by which time the pall is entirely out of the notch, and of course disconnected from the shaft *h*. On the other end of this shaft is fixed, by means of a set-screw, the arm *g*, which carries the sliding counter-weight I. This arm is so placed on the shaft *h*, that when the weights E, and H, are up, it hangs nearly perpendicular; but when one of the weights descends, and turns the shaft *h*, (by means of its connection with the pall and notched collar) the counter-weight I, rises; and when the pall is tripped, and the shaft released, the counter-weight I, descends, turning the shaft *h*, in the contrary direction. In the centre of this shaft is the arm J, fixed to it by means of set-screws; the other end of this arm J, is jointed to the arm K,

which projects from the ink-roller frame or carriage. Before the weights E, and H, have acted on the shaft *h*, the arms J, and K, stand nearly upright, and are, as it were, folded up; but, as either of the weights E, or H, turns the shaft *h*, as before described, the arms J, and K, are stretched out, and thus drive the composition inking-roller C, over the form: when the weight is tripped, the shaft *h*, inking-roller C, and other parts, are brought back to their first position by the counter-weight I. The roller-frame is kept in this position by the end of the sliding-rod *o*, sliding in front of it, through a piece *n*, which projects from the brace *m*, and its other end is jointed to the lever *j*; and, as the tympan is thrown back, it strikes and moves the lever *j*, and draws the sliding-rod *o*, from before the arm K,—thereby setting it at liberty, and allowing the inking-roller to pass over the form of type. The fountain F, has a trough and ductor-roller, as usual. L, is a stiff piece of metal, firmly fixed to the trough; and under this piece, secured to its back edge, is a thin steel ductor, which lies in a horizontal position, with its front edge nearly touching the roller, some distance above its centre. The points of the screws o^1, o^1, o^1, bear on the ductor, and by turning them, the ductor being very thin, it can be sprung down on the roller; and thus, as the roller revolves, the ink is scraped entirely off, or the quantity passed through may be increased or decreased at pleasure. The fountain has journals d^1, d^1, which hang in bearings on the side frames; and the journals are so placed that the front side of the fountain is considerably the heavier. To the front side is attached the piece *i*, under which the lower end of the lever *j*, rests; so that when this lever is moved by the tympan, it lifts the front side of the fountain. Directly over the fountain-roller, and at a small distance above it, lies the small wooden distributing-roller *d*, (fig. 13,) which is covered with cloth, and kept pressed against the large distributing-roller D, by spiral springs, in the cases c^1, acting against its journals. On the end of the fountain-roller is fixed the ratchet i^1; and above hangs from the frame the pall g^1,—the lower end always being in one of the teeth of the ratchet i^1. Now, when the fountain is lifted, the ratchet strikes the pall, and thus causes the fountain-roller to partially revolve, and bring out on its surface a proper quantity of ink; also, by the lifting of the fountain, its roller touches the small distributor *d*, and imparts to it a supply of ink. *e*, is another small roller, similar to *d*, turning in bearings in the side frames, and lying against the roller C, when that roller is receiving and distributing ink. The roller C, receives

and distributes its ink while resting, and revolves by friction on the large distributor D; and for this purpose its journals run in adjustable bearings in the roller-carriage, and are regulated in height by nuts, according to the size of the roller. It will be seen that, the rollers being all in contact one with another, when the distributor D, revolves, all the other rollers must revolve also, and thus distribute the ink received by the roller *d*, from the fountain. On the ends of the roller-carriage are the friction-rollers a^1, a^1, which run on the two projecting pieces b^1, b^1: these carry and guide the roller C, on to the bed of the press, on which are placed pieces or bearers to guide the roller C, when passing over and inking the form of type.

The operation of the apparatus is as follows:—The bed of a hand printing press always being out from under the platten when the form is being inked, the machine is placed behind it. The pieces l^1, l^1, are brought, by adjusting the position of the machine, to a level, and in a line with the pieces on the bed called the bearers, for the friction-rollers a^1, a^1, on the roller-frame, for the carriage K, to run on. The two cords or bands *a*, and *b*, are then secured, the one to a piece on one end of the bed of the press, and the other to a piece on the other end; and the bed is run in under the platten. This motion of the bed will unwind the cord *a*, from the screw G, and by causing the distributing-roller D, to revolve at the same time, will wind the cord *b*, upon the screw G. The revolution of the distributing-roller winds up the cord *u*, on its shaft *c*; which cord being connected to the cords *v*, *v*, raises the weights E, and H, until the pall *x*, on the arm of the weight E, drops in the notch in the collar r^1, on the shaft *h*, and the pin p^1, in the lever of the weight H, has pressed back and passed the projection on the spring q^1, which then springs underneath the pin p^1. The impression having been given, the bed of the press is now run out as usual; and the cord *b*, by unwinding, turns the distributing-roller D, in the opposite direction,—the cord *a*, being wound around the screw G. At the same time the cord or band *u*, is unwound from its shaft *c*,—thus leaving the weight E, free to descend, were it not held by the sliding-rod *o*, being in front of the arm K; and the other weight H, is held by the pin p^1, resting on the projection from the spring q^1. The tympan of the press is now thrown up, when its side strikes the projecting pin *p*, on the lever *j*, moves it, and draws back the sliding-rod *o*, and sets the carriage and roller free. The weight E, now descends, drives the inking-roller across the

form, and raises the counter-weight I, on the other end of the shaft *h*. As the weight E, descends, one end of its pall *x*, strikes the tripping-piece *z*; which piece trips it out of the notch, and thus disconnects the shaft *h*, and also stops the weight E. The counter-weight I, now acts, and turns the shaft *h*, in the contrary direction,—thereby drawing back the carriage and roller, until the notched collar s^1, on the shaft *h*, catches the hooked pall *y*, and moves it sufficiently to draw the projection on the spring from under the pin p^1, in the lever of the weight H. This weight now, in its turn, descends, and its pall *x*, catching in the notched collar r^1, thus again drives the roller over the form. The pall *x*, on its arm striking the piece *z*, trips, as in the case of the other weight and pall. The counter-weight I, this time, brings back the inking-roller to its original position on the distributor D, to receive a fresh supply of ink. The notched collar s^1, of course again catches and draws back the pall *y*, with the spring q^1; but as the shaft *h*, is now brought to its original position, the pall *y*, slips out of the notch, and the spring takes its place, ready to hold up the weight H, when raised. Thus, as will be seen, the inking-roller is made to pass twice over the form of type and back.

The taking and distributing of ink is effected as follows:—A supply of ink first being put in the fountain F, the motion given to the lever *j*, by the tympan, raises the front of the fountain F, by means of the projecting piece *i*, under which the end of the lever *j*, rests. The motion of the fountain brings a tooth of the ratchet i^1, on the end of the fountain-roller, against the end of the pall g^1,—thus turning it and bringing out on the surface of the roller a fresh supply of ink; and by the same motion the fountain-roller is brought in contact with the small distributor *d*, and imparts to it a proper quantity of ink. A sheet of paper having been put on the tympan, it is thrown down,—the fountain of course falls and moves the lever *j*, and thereby throws the sliding-rod *o*, in front of the arm K, (as before described); and the pall g^1, drops into the next tooth on the ratchet i^1. The running in of the bed gives motion to the large distributor D, causing it to revolve, and vibrate, and drive all the rollers in contact with it, and thus distribute the ink. The cord is again wound up on the shaft *c*, and the weights raised up as before; the next impression being given, the bed is run out, again drives the rollers, and distributes the ink. The tympan is thrown up and the roller again passes over the form

and back, as before described, and so the working may be continued as long as desired.

The patentee claims the construction or arrangement of an apparatus, as herein described, whereby inking-rollers may be furnished with a suitable supply of ink, and be made to pass over and ink the form of types of a hand press,—such apparatus being actuated by the ordinary motions of a single pressman in working a hand press.

The next part of the invention consists of a machine for inking the type on a common hand press by an independent motive power;—the object being to do the finest work by this means.

Fig. 14, represents the machine in perspective view, and fig. 15, shews it in geometrical cross section. A, A, are the end frames; B, is a cross brace, which connects them together; and D, is a large distributing-roller, driven by a belt *b*, over the pulley *a*, from some prime mover. This roller has also a vibrating lateral motion, caused by a right and left-handed screw on one end of its shaft, which works in a swivel piece. The two composition inking-rollers *c*, and *d*, rest upon the distributing-roller D, below; and against this latter are the three small rollers *e*, *f*, and *g*, made of composition, or wood covered with cloth: *e*, and *g*, serve only to aid the distribution of the ink; *f*, takes ink from the fountain-roller E, and transfers it to the large distributor D;—as the distributor D, is constantly revolving, the ink is being distributed all the time. The belt G, over the pulley *h*, is driven from some prime mover, and actuates the shaft *i*, which has on one end the grooved pulley *j*. The band *k*, passes over this pulley, and down and around the grooved pulley *l*; and as the shaft *m*, (on one end of which is the pulley *l*,) lies at right angles with the shaft *i*, the belt or band *k*, makes a half turn. The bearing of the end of the shaft *m*, near the pulley *l*, is formed by a piece *o*, hung in journals, one in the piece *p*, and the other in the side-frame;—thus allowing the end of the shaft *m*, on which is the worm *q*, to be raised or lowered, to throw into or out of gear the worm *q*, with the worm-wheel *r*. This end of the shaft runs in a sliding-box *s*, in the piece *t*, bolted to the frame. The worm-wheel *r*, is on one end of the shaft H, and on its other end is the toothed wheel *u*, which gears into another toothed wheel *v*, having an equal number of teeth. On the other end of the shaft I, from the wheel *v*, is the crank *w*. The connecting-rod *x*, connects it to the arm *y*, secured on the shaft *z*. In the centre of the

shaft z, is the arm J, fastened by set-screws; and its other end is jointed to the forked-arm K, whose forked ends are jointed to the ink-roller frame or carriage a^1, a^1, which carries the inking-rollers c, and d. This frame has two small friction-rollers b^1, b^1, at each end, which run on the ways c^1, c^1, and support the ink-roller frame or carriage. In fig. 15, d^1, is a forked-arm, which is jointed, at its plain end, to the lever e^1: this forms part of the frame which carries the taking-roller f, and has the point f^1, for its fulcrum. The prongs of the forked end pass on each side of the shaft H, and by the side of the cam g^1, which, as the shaft revolves, strikes the pin h^1, and so lifts the arm d^1, thereby raising the lever e^1, and of course depressing the taking-roller f, till it strikes the fountain-roller E, to take ink. i^1, is a small spiral spring; one end of which is secured to the frame, and the other end to the arm or lever e^1, keeping the pin h^1, always against the cam g^1, and the taking-roller f, against the distributor D, except when taking ink. j^1, is a lever; one end of which is held by the spring k^1, against the cam l^1, (fig. 14,); the other end having the pall m^1, jointed to it. This pall drops into the teeth of the ratchet of the fountain-roller E. o^1, is a short shaft, mounted in bearings in the piece p^1, p^1, which is bolted to the side frame. On one end of this shaft is an arm, to which is jointed the hook-piece n^1, having a projection made on one side, which the trip-piece s^1, strikes against, to throw the hook from under the end of the shaft m. q^1, is an arm or lever, having a small pin r^1, projecting from its top end; and it is secured by a set-screw to one end of the short shaft o^1. The machine is placed behind a common hand printing press, and is so adjusted that the ways c^1, c^1, are in a line with and nearly touch corresponding ways or bearers on each end of the bed of the press, when the bed is run out from under the platten. It is put in motion by means of the belts G, and b. The belt G, drives the shaft i, pulley j, and, by the belt k, the pulley l, and its shaft m, with its worm q. This worm drives the worm-wheel r, when in gear, and its shaft H, and the toothed wheel u, which drives the toothed wheel v, and its shaft I, and of course the crank w, on the other end of the shaft I. The crank w, by means of the connecting-rod x, moves the arm or lever y, up and down;—thus turning backward and forward the shaft z, and of course the arm J, and the forked-arm K, which, as will be seen, moves the ink-roller frame or carriage out over the form and back, as often as the crank w, makes a revolution. The tympan of the press, when thrown up, strikes the pin r^1, on the lever q^1,

turns the shaft o^1, and raises the short arm on the other end of the shaft, thereby raising the hooked-rod n^1; the hook being under the end of the worm-shaft *m*, raises it, and the worm comes into gear with the worm-wheel *r*, which makes an entire revolution; when the trip-piece s^1, strikes the projection on the arm n^1, and trips the hook, at its end, from under the end of the shaft *m*, and the worm drops out of gear from the wheel *r*, which ceases to move, and of course the inking-rollers stop and rest on the distributor D,—the trip-piece being so adjusted as to act at that time. When the tympan is thrown down, its pressure being taken from the arm q^1, the hooked-rod n^1, falls, and its hook drops under the end of the shaft *m*, where it rests till the tympan is again thrown up. The projecting-piece on the arm n^1, drops below the tripping-piece s^1, which has a rule joint, to allow its end to be lifted by the projection, so as not to trip at that time. If it is thought desirable to make the inking-rollers pass over the form more than once, it will only be necessary to make the wheel *u*, so many times larger than the wheel *v*, as it is desired to drive the rollers over and back across the form. The belt *b*, drives the large distributor D; and all the other rollers, when in contact with it, are driven by it. At every revolution of the shaft H, the cam l^1, moves the lever j^1; and the pall m^1, on the upper end of the lever j^1, hooking into a tooth of the ratchet on the fountain-roller, turns the roller, —thereby bringing up from the fountain a supply of ink on the roller E. The taking-roller *f*, is made to fall from the distributor to the fountain-roller, to take ink, and rise back to the distributor, to which it imparts the ink, by means of the cam g^1, forked-arm d^1, pin h^1, and lever e^1. The cam g^1, being on the shaft H, must move the taking-roller *f*, down and up once for every revolution of the shaft.

The patentee claims, 1st,—putting the worm in and out of gear with the worm-wheel, for driving the rollers over the form. 2nd,—causing the rollers to pass more than one time over the form and back, by changing the gearing connecting the two shafts *u*, and *v*. 3rd,—the method of taking and serving the ink. 4th,—the general arrangement of the machine. 5th,—the arrangement of apparatus herein shewn and described, whereby the form of types of a hand-press may be inked without the aid of a workman, and the inking-rollers may be carried over the type any number of times that may be required, by merely altering the relative size of some of the toothed wheels.

The last part of the invention consists in various mechanical

contrivances and arrangements for printing with rapidity, from a form of types, address or business cards.

Fig. 16, is a side elevation; fig. 17, a plan view; and fig. 18, a longitudinal section of the machine. A, is the side framing. B, is the driving-shaft, on which are fastened the driving-excentric C, and the grooved pulley *a*, the toothed pinion E, and fly-wheel D. F, is a treadle, for driving this shaft by means of the excentric C, and the band *b*, which passes around the friction-roller *c*, in the treadle. The pinion E, gears into the toothed-wheel G, which is keyed on to the impression-shaft H; and to this shaft are securely fastened two cams *d*, and J. In the cam J, there is a groove, in which works a small friction-roller that is fastened to the sliding-bar *g*; the end of the sliding-bar *g*, is jointed to a short slotted crank or arm, secured on the shaft *h*. On this shaft is fastened, by set-screws, the arm K; through the opposite end of which the cross-head *i*, passes; and on each end of this cross-head are the small connecting-rods *j*, *j*, which are attached at the other end to the inking-frame L, which slides in grooves in side-pieces S, and carries two small composition inking-rollers *k*, *k*: the motion communicated to this frame from the cam J, carries it down and up between the type on the bed I, and the platten M, and thus inks the type. A thin piece of metal *l*, (termed a feeder,) is fastened to the roller-frame, and has a small sharp projection on one side, about equal in thickness to one card. In front of this feeder is a box O, to hold the cards to be printed, which are kept pressed against the front by the sliding-rod *m*, to which is attached, by a cord running over a pulley, a weight *n*, sufficient for that purpose. Directly under the front card is an aperture through the bottom of the box, large enough for one card to pass through at a time: the card is kept from dropping through by the pressure from the weight *n*. Underneath the aperture, on each side, is a groove or channel to conduct the card between the bed and platten. *t*, is a stop-piece, also adjustable to suit different sized cards, on which the card drops, and is thus held in a proper position to receive the impression, which is given by the cam *d*, operating against the friction-roller *e*, moving forward the bed I, on which is secured the form of types,—this being done while the inking-rollers and roller-frame are up. The piece *t*, is fixed on the shaft *u*, by a set-screw, and is moved by the arm *v*, of the shaft being struck by a pin *y*, in the toothed wheel G, and thus releases the card. The large distributing-roller N, is supplied with ink by hand, or by a fountain, if thought desirable; and the inking-rollers *k*, *k*,

are kept up against the distributor by springs, and thereby receive their supply of ink. The distributor N, revolves constantly, as it is driven by the band from the grooved pulley *a*, on the driving-shaft B. A lateral motion is given to the distributing-roller N, by causing the oblique cam *p*, on one end of its shaft to run against the friction-roller *q*, against which roller it is held by the spiral pressure spring *r*, on the other end of the shaft. Two small composition rollers *s*, *s*, rest on the large roller N, and revolve by friction against it,—their use is simply to distribute the ink more perfectly. The platten M, is held by the two sliding-rods *x*, *x*. The impression is adjusted or regulated by the wedge R, (fig. 18,) which may be drawn up by turning the nut *z*, above. The mode of operating the machine is as follows:—The cards are put in the box O, and a supply of ink is put on the distributing-roller N; the machine is then put in motion by the treadle F, through the band *b*, and excentric C, which causes the shaft B, to revolve and drive the distributing-roller N, as well as the impression-shaft H. The cam J, on this shaft, being connected by the sliding-bar, crank, and arm I, to the ink-roller frame, draws down and up the rollers between the type on the bed and the platten,—thereby inking the face of the type. As the ink-roller frame passes down, it carries with it the feeder *l*, and the projecting-piece on it strikes and draws down the front card through the aperture into the grooves, where it is stopped by the stop-piece *t*;—here the card remains to receive the impression. The feeder *l*, then passes up with the ink-roller frame and rollers; the bevilled edge of the feeder strikes against the cards, springs back until it passes above them, and then resumes its original position; and the inking-rollers commence to receive and distribute a fresh supply of ink. The cam *d*, now drives forward the bed, which gives an impression to the card, and is drawn back by the spiral spring *f*. While the bed is being drawn back, the pin *y*, on the toothed wheel G, strikes the lever *v*, whereby the stop-piece *t*, is moved from under the card, which falls into a box placed below to receive it.

The patentee claims, 1st,—the adjustable card-box with the grooves; also the use of the grooves separately for feeding cards in by hand; and also the use of the card-feeder *l*. 2nd,—the mode of working the inking apparatus; and also the manner of giving the impression by a sliding-bed or platten, operated on by a cam, crank, or toggle-joints, or a combination of them, to obtain an alternating motion. 3rd,—driving the machine by the foot, so that both hands of the

workman are at liberty; and also the arrangement by which the card is released from the machine, after it has been printed. And, 4th,—the general arrangement of the parts as described, or any mere modification thereof.—[*Inrolled January*, 1849.]

To JOHN ASHBY, *of Carshalton, in the county of Surrey, miller, for certain improvements in machinery applicable to cleaning grain and dressing meal.*—[Sealed 12th October, 1848.]

THIS invention consists, firstly, in improvements on the machines now used for cleaning grain;—the object being to cause such machines to act more efficiently than heretofore.

The invention consists, secondly, in the application to flour-dressing machines of an exhausting apparatus, for drawing off the air which enters the wire-gauze cylinder or bolting-cloth with the meal;—the object being, in this case, to greatly facilitate the dressing operation.

In Plate XVII., fig. 1, represents, in vertical section, the machine for cleaning grain, commonly known as the corn-screen or smut-machine, with the improvements applied thereto. It consists of a vertical cylinder A, mounted on a central shaft B, which works in suitable fixed bearings. The cylinder A, is enclosed within a stationary cylinder C, and is made to revolve rapidly therein, on receiving motion through a band and pulley or gearing from any first mover. These cylinders are termed—the cleaning-cylinders, as the grain supplied to the machine falls into the space between them, and, by coming in contact with their surfaces, is cleansed of the dirt and other matters adhering to it. D, is a cylindrical case, for supporting and enclosing the cylinder C; and D*, is a case in connection therewith, forming a chamber to receive the corn after it has been cleaned, and also the refuse matters separated therefrom. This case D*, also supports the exhausting apparatus, which consists of a fan-wheel *a*, mounted on a shaft *b*, and surrounded by a cylindrical case *c*, open at bottom, to allow of a free vent for the air from the case D*. E, is a shute, placed at the bottom of the cylinders A, C, and is intended to receive the grain after it is cleaned, and convey it into the case D*, where it meets with a current of air, which separates the dirt and other light extraneous matters from the grain.

The improvements effected in this machine refer, firstly, to the construction of the cleaning-cylinders; and, secondly, to

the means of regulating the blast of air which, by its action, separates the grain from the refuse matters. Instead of employing the ordinary wire-gauze to cover the framing of these cylinders, the patentee provides a material composed of vertical angular bars, attached together by strips of sheet-iron, in sets of two or three together; which strips are interlaced between the angular bars. These strips are introduced at such distances apart as will ensure the proper strength of the fabric, without covering too much of the acting surface of the vertical bars. By referring to figs. 2, and 3, which shew this fabric in face view and in cross section, its peculiar construction will be readily understood. The angular bars (which may be either square or triangular,—the latter form is preferred) are placed at such equal distances apart as to prevent the escape of the grain; and have an angle projecting from the face of the fabric, as shewn at fig. 3. The cross strips of metal are intertwined after the manner of making wicker work. This covering for the cleaning-cylinders the patentee prefers to make in semi-cylindrical pieces, and he provides the longitudinal edges thereof with bars *a**, *a**, *a**, so that the pieces may be attached to the frame of the dressing-cylinders, by securing the edge-bars together, respectively, by bolts and nuts, as shewn. By thus constructing the covering for the cleaning-cylinders the fabric may be readily removed when worn out, and replaced by new semi-cylindrical pieces (made to a given size), without the assistance of an engineer or mechanician. These projecting angles form the working surfaces for the cleaning-cylinders; and, when the inner cylinder A, is made to rotate with great rapidity, the grain will be driven against the rough-ribbed surface, thus formed, and be effectually freed from any extraneous matter adhering thereto; while the kernels of smut will be reduced to powder, which, if it does not escape through the periphery of the cylinder C, will fall with the grain into the shute E. This shute E, is furnished with a hinged cover F, which presses on the falling grain, and prevents air from being drawn through the cylinders. The arrangement for regulating the current of air, which is employed to separate the cleaned grain from the refuse matters, is shewn in fig. 1. G, is an adjustable hinged partition, placed in the case D*, and intended to contract or enlarge the space which is to be exhausted by the exhaust-fan. H, is an adjustable hinged board, placed opposite the end of the shute E, for the purpose of contracting or expanding the entrance for the current of air, which ascends to fill up the vacuum in the case D*; and I, is another hinged board, capable of adjustment,—its object

being to separate the refuse matters from the grain, by interposing, at a suitable height, an obstruction to the further progress of the grain, when driven forward by the upward current of air, indicated by the arrow. By making the partition G, and the boards H, and I, adjustable, it will be readily understood, that the current of air may be regulated so as to cause the perfect separation of the refuse matters from the cleaned grain.

In the drawing the patentee has shewn his improvements as applied to a stationary corn-screen, such as those used by millers, and driven by water or wind power; but he proposes also, by reducing the proportions of the various parts, and supporting the machine on a moveable frame, to render his improved grain-cleaning machine applicable to the use of farmers,—the reduced size allowing of the machine being worked by manual labor.

Under this head of the invention he claims, Firstly,—the covering of the cylinders of grain-cleaning machines with a fabric composed of angular bars of iron, held together by strips of interlaced sheet metal, set at suitable distances apart, as above explained and shewn in the drawings; and, Secondly, —the arrangement for regulating the current of air in grain-cleaning-machines, as above explained.

The improvements in machinery for dressing meal or flour are shewn at figs. 4, and 5; fig. 4, being a sectional elevation of a vertical flour dressing machine, with the improvements attached; and fig. 5, a plan or top view of the same. A, A, is the wire-gauze cylinder, mounted according to the invention for which a patent was granted to William Ashby, 25th April, 1846.* Within this cylinder a rotating-brush, carried by the central shaft B, is placed, for the purpose of throwing the flour through the meshes of the wire-gauze cylinder on to the revolving tables or floors C, and D; the upper of which receives the first quality of flour; while the lower one receives the second quality, or "middlings," as is well understood. In the side of the case E, which encloses the wire-gauze cylinder, an opening is made, extending from the top of the case to the level of the first table; and over this opening, so as to form a covering thereto, a vertical pipe F, is placed. The upper end of this pipe is made cylindrical, and forms a case, open at top, for the reception of an exhaust-fan G, which is mounted on a vertical spindle, and is caused to rotate with great rapidity by means of a band from a pulley H, on the main driving-shaft

* For specification of this invention, see Vol. XXX., p. 94, Conjoined Series.

of the machine, passing round a small pulley, keyed on to the spindle of the exhaust-fan G. The manner in which the improvements on this machine effect the desired end, viz., the facilitating of the dressing operation, will be readily understood by the practical miller. The meal is fed into the machine by the shute I, whence it falls into the cylinder A, and has a centrifugal force given to it by the rapid rotation of the brush on the spindle B, whereby it is thrown (together with the air drawn into the cylinder at its upper end, by the rotation of the brush,) through the meshes of the cylinder A, and the flour is deposited on the table C. When therefore, by the action of an exhausting apparatus, a strong tendency is established for a current of air to flow into the cylinder, and through the wire-gauze periphery, it necessarily follows that the operation of flour-dressing is greatly facilitated. When the flour has thus escaped, it will (being no longer agitated and held in suspension by the rotating-brush) fall on to the revolving-table, and be discharged therefrom at the usual vent. The second quality of flour, or middlings, will be discharged, as usual, on to its table; and the bran or offal will fall through the bottom of the cylinder. In applying this improvement to the inclined cylinders commonly used for flour dressing, the patentee employs a brushing apparatus, for keeping the periphery of the dressing cylinder clean and the meshes thereof open. Fig. 6, represents, in side view, the inclined cylinder, as fitted with the improvements for facilitating the operation of dressing meal,—a part of the cylinder being broken away, the better to explain the improvement; and fig. 7, represents, in plan view, the parts for actuating the brushes. A, A, is the dressing cylinder, mounted, as usual, in its case; and, by the side of this cylinder, as indicated by the dotted lines, is the exhaust apparatus B, for drawing the air through the meshes of the cylinder. To the upper surface of the cylinder A, a series of brushes *a, a, a,* is applied;—the design being, that each brush shall, by traversing over a portion of the periphery, limited by the outside hoops thereof, keep the meshes of such part clear for the passage of the flour through them. These brushes are attached to rods *b, b,* which project from, and are bolted to, a bar *c,* extending from one end to the other of the cylinder A. This bar is supported at one end by means of a pin, projecting therefrom, and sliding in a fixed guide *d,* near the lower end of the cylinder. At its other end this bar is attached by a universal joint to an arm *e,* keyed to a rocking-shaft *f,* which has its bearings on the outer casing of the cylinder. To this shaft *f,* another arm *g,*

is keyed, for the purpose of receiving, from an excentric or crank-pin on the face of a cog-wheel *h*, a vibrating motion, through a connecting-rod *i*, and conveying that motion to the brushes *a*, *a*. The cog-wheel *h*, is mounted loosely on a stud, projecting from the head end-plate *k*, of the cylinder; and on the boss of this wheel a pinion is keyed, which takes into a wheel *l*, similarly provided with a pinion, and also mounted loosely on a projecting stud on the end-plate *k*. *m*, is a pinion, keyed on to a stud, which revolves in bearings in the end-plate *k*; and *n*, is a second pinion, on the same stud, in gear with a ring of teeth *o*, attached to the outside of the cylinder A. Rotary motion is given to this gearing by a pinion *p*, keyed on to the central shaft C, (which carries the internal rotating brushes) and taking into the wheel *h*, before mentioned; and thus a slow rotary motion is communicated to the cylinder A, for the purpose of bringing its periphery under the action of the external brushes *a*, *a*; while, at the same time, a traverse-motion, in the direction of the length of the cylinder, is given to the brushes *a*, by means of the crank-pin and connecting-rod *i*, for the purpose of clearing the meshes of the cylinder of coagulated particles of the meal. When the longitudinal ribs of the cylinder A, come in contact with the brushes *a*, *a*, the bar *c*, which carries them, rocks in its supports sufficiently to allow the ribs (which, by their pressure on the brushes, cause this movement) to pass under the brushes without injuring them.

In applying the exhausting apparatus to the common bolting-cloth machine, an opening is made in the side of the case (which is made air-tight), and over the opening a pipe or case, which contains the fan-wheel, is placed; then, by means of a band and pulleys or gearing, rotary motion is transmitted from the spindle of the bolting-cloth reel to the fan-wheel; and thus the partial exhaustion of the case is effected; which exhaustion, as before explained, greatly facilitates the operation of separating the offal from the flour.

Under this head of the invention, the patentee claims, First,—the application to machines for dressing meal or flour of an exhausting apparatus, whereby the air, which enters the dressing-cylinder or bolting-cloth, may be drawn out at the periphery thereof, for the purpose above set forth; and, Secondly,—giving a traverse motion, in the line of the dressing-cylinder's axis, to the external brushes of meal or flour dressing machines, for the purpose above set forth.—[*Inrolled April,* 1849.]

To John Henderson Porter, *of* 2, *Adelaide-place, London Bridge, in the City of London, engineer, for an improved mode of applying corrugated iron in the formation of fire-proof floors, roofs, and other like structures.*—[Sealed 2nd December, 1848.]

This invention consists in the application, in the construction of fire-proof floors, roofs, and similar structures, of two or more plates of corrugated iron, placed one over the other,—the corrugations of one plate being so situated with reference to the corrugations of the other, that, when the plates are rivetted or bolted together, they will form a series of united tubular ribs; which ribs are to be used either in a horizontal, arched, or inclined position, as joists, beams, ribs, rafters, or other like supports;—their construction being such that they will resist, as a series of arches and inverts, whatever superincumbent weight they may have to bear.

In Plate XVII., figs. 1, and 2, represent end views of two different forms of corrugated plates, which may be used for the purposes above mentioned,—the plates being united by rivets at *a*, *a*. The form of corrugation may be varied; but that preferred by the patentee is shewn at fig. 3. In this figure the corrugated plates are represented as forming a united series of tubular horizontal beams or joists, and applied to the formation of a level boarded and ceiled floor. For this purpose, the corrugations or grooves in the upper side of the top plate may be filled with concrete *b*; the flooring boards *c*, are nailed to fillets of wood *d*, which are laid across the upper parts or ridges of the corrugated plate, and secured at intervals by bolts *e*, and nuts *f*; and, in order to form the ceiling, fillets of wood *g*, are secured by bolts *h*, and nuts *i*, to the under side of the lower plate, at suitable intervals; and to these are nailed the laths *j*, which receive the plaster *k*, in the ordinary way.

In the drawings attached to the specification a roof is shewn, formed of two sets of united corrugated plates, which are placed in inclined positions, with their upper edges (or the upper ends of the corrugations) meeting at the angle or hip of the roof.

The patentee claims the mode, above described, of applying corrugated iron in the formation of fireproof floors, roofs, and other like structures.—[*Inrolled June*, 1849.]

To John Gardner, *of Wakingham, in the county of Berks, engineer, for improvements in girders for bridges and other structures.*—[Sealed 9th December, 1848.]

The patentee states, at the commencement of his specification, that by the term girders he means all beams, bars, or bearings employed in engineering, building, and architectural structures, where materials of great tensile and compressive force are required, as in bridges, viaducts, aqueducts, railways, archways, dock-gates, roofings, and floorings; and the invention consists in making the same of cast-iron, with a strengthening bar or bars of wrought-iron embodied or dovetailed into the same.

In Plate XVII., fig. 1, is a side elevation of part of a girder constructed according to this invention; fig. 2, is an under side view of the same; fig. 3, is a section taken on the line A, B, of fig. 1; and fig. 4, is a section taken on the line C, D, of fig. 1. *a*, is the cast-iron girder; *b*, *b*, are the bottom flanges thereof; and *c*, *c*, are two wrought-iron bars, which are inserted into the bottom of the girder, at a small distance apart, and, at the centre of each flange, they are slightly bevilled outwards on each side, so as to be dovetailed, as it were, into the girder at those parts. The wrought-iron bars are introduced in the process of casting the girder;—such bars having been previously rolled into the required sectional form, and well cleansed from oxide by heating them in a furnace or otherwise. Fig. 5, exhibits a transverse section of a cast-iron girder *d*, strengthened by one bar of wrought-iron *e*, which forms the entire bottom of the girder, and is connected to the upper part by a central ridge, of a dovetail form in its cross section, and of an undulating form in the longitudinal direction. Various other modifications in the form of the wrought-iron bars may be adopted. The patentee states that "figs. 6, and 7, shew how this compound mode of construction may be adapted to railway bars and bearings where these are (as is now ordinarily the case) of great weight:—C, C, are the cast-iron parts; and W, W, are the wrought-iron parts."

The patentee claims the making of girders for bridges and other structures (using the term girders in the sense before explained) of cast-iron and wrought-iron, combined together in the manner before described.—[*Inrolled June*, 1849.

To Henry Newson, *late of Smethwick (near Birmingham), in the county of Stafford, but now of Clapham, in the county of Surrey, engineer, for an improvement or improvements in trusses.*—[Sealed 23rd November, 1848.]

The improved trusses described in this specification each consist of a spring (or, in the case of double trusses, of two springs), with a pad, button, or disc, at each end thereof,—the spring being made of a rod or piece of steel, which is round, or as nearly round as conveniently may be. The object of the patentee, in constructing a truss in this manner, is to obtain a spring, which may be bent with equal facility in every direction; so that it may accommodate itself to all the varying positions of the body of the wearer, without materially diminishing the pressure of the instrument upon that part of the body which it is designed to support or protect.

The mode of making the truss is as follows:—The patentee takes a piece of cast-steel wire, of the best quality, and of the requisite thickness and length, and heats each end of it; and he then flattens these ends to receive the rivets, by which they are to be attached to the pads or discs; but, in some cases, instead of the ends being flattened to receive the rivets, a screw-thread is formed on each, and they are screwed into nuts affixed to the pads or discs. The wire is annealed in the ordinary manner, and, whilst hot, a hole is punched in each enlarged end to receive the rivets; after the wire has become cold it is bent to the required shape; and it is then hardened. If the patentee hardens the whole length of the wire, he afterwards heats about an inch at each end, so as to render those parts soft, and capable of being bent or twisted; but, generally, he avoids hardening these portions, by preventing them from being immersed in the cold water into which the remainder of the wire is plunged: the ends are made or kept soft in this manner for the purpose of enabling the wearer of the truss to bend or twist them, with their pads or discs, in such manner as to cause them to fit accurately and comfortably against the parts on which they are to be worn. The piece of steel wire is now polished and brightened; and, after this, the hardened part of it is tempered in the usual manner;—the required effect being obtained when the blue tint is produced. The pads or discs may be formed either with or without a cushion on the face thereof. The whole truss may be covered with leather or other suitable material; or the truss (exclusive of the cushions, if there be any) may be

japanned, varnished, plated, or protected in any other way from rust or injury.

In Plate XVII., fig. 1, is a side view and fig. 2, an edge view of a truss, without covering or cushions, to be worn for an inguinal or femoral hernia on either side of the body. Fig. 3, shews the truss, covered with chamois leather, and stuffed in the ordinary way. Fig. 4, exhibits one of the pads or discs in section, with a nut *a*, affixed thereto; by means of which it is attached to the screwed end of the wire *b*. Fig. 5, represents a double truss, without any covering, cushions, or stuffing: it consists of two single trusses, connected together by means of a piece of webbing or flexible material *c*, attached to the two back pads or discs *d, d*. Fig. 6, shews the double truss, after it has been covered and stuffed.

Although the trusses, above described, are only suitable for inguinal or femoral hernia, yet trusses, constructed according to this invention, are also applicable in cases of ruptured navel, or any other description of hernia, or in cases which, from any other cause, require such a pressure as can be given by means of such trusses upon any part of the body.

The patentee claims the mode or modes of constructing trusses, of the description above mentioned, of springs, made round, or as nearly so as conveniently may be, and of pads or discs, attached thereto in manner above described.—[*Inrolled May*, 1848.]

To John Armstrong, *of Edinburgh, in the county of Mid-lothian, brass-founder, for improvements in constructing water-closets.*—[Sealed 2nd December, 1848.]

A vertical section of the improved water-closet is shewn in Plate XVII. *a*, is the basin, usually formed of porcelain or earthenware; but it may be made of metal or other material. *b*, is the soil-pipe and cess-pool, generally made of lead; but it may be made of cast-iron, brown pottery ware, or other suitable material,—cast-iron is preferred. *c*, is the valve-box, which is peculiar to this closet, and may be made of cast-iron or other suitable material. *d*, is a brass side-valve, suspended by the hinge *e*, and closing the end of the discharge-pipe *f*; the edge of the valve bears against a washer of gutta-percha or leather *g*; and at the back of the valve is fixed a brass quadrant *h*, connected by the arm *i*, with the brass rod *j*, which passes through a stuffing-box in the top of the valve-box, and is screwed into the socket of the pull *k*; so that when the pull *k*, is raised, the valve *d*, will be drawn back to

prevent the discharge of soil from the pipe *f*. The arm *l*, is connected with the ball-lever in the cistern. The rod *j*, and parts connected therewith are guided in their movements by two slides *m*. *n*, is the overflow-pipe from the basin, connected with the valve *o*;—*p*, is the opening at which the water enters the basin from the supply-pipe *q*; and *r*, is a lead ball, to act as a counterbalance weight.

The advantages of this construction of water-closet are stated to be, first, economy in price,—it can be made and have all its parts put together in the workshop; and it will only be requisite to unite the inlet water-pipe and the outlet soil-pipe with their corresponding pipes at the place where it is to be used;—secondly, economy in water, as it will require less water than other water-closets.

The patentee does not confine himself to the above details. He makes no claim to the separate mechanical parts, nor to the combination, other than the vertical arrangement of the side-valve *d*, and the parts connected therewith.—[*Inrolled June*, 1849.]

To Robert Burn, *of the City of Edinburgh, in the county of Midlothian, for an improved roller-gin, used in separating the seed from cotton.*—[Sealed 2nd December, 1848.]

The improved roller-gin is represented in Plate XVII.;—fig. 1, being a side elevation thereof; fig. 2, an elevation of the opposite side, with the case or cover removed; and fig. 3, exhibiting some of the parts detached. The improvements consist, in the application to the roller-gin, of a rotary brush or "brush-fan" *a*,—a steel roller *b*,—fixed steel bearings *c*, (fig. 1,) for the steel roller *b*, and moveable steel bearings *d*, (fig. 2,) for the wooden roller *e*, (fig. 3,)—and an endless cloth or apron *f*, covered with card teeth. By the use of the rotary-brush *a*, the cotton is freed from all extraneous materials more completely than by the present roller-gin; by employing the steel roller *b*, and steel bearings *c*, *d*, (instead of brass, iron, or wooden bearings, as hitherto used) the roller-gin is rendered more durable, and will work with greater accuracy; and, by the use of the endless cloth *f*, covered with card-teeth, the seed-cotton is supplied to the gin more regularly and at less cost than by manual labor.

The other parts of the machine (not claimed by the patentee) consist of a cast-iron framing *g*, carrying the main shaft *h*; on the right-hand end of which are fixed fast and loose pulleys *i*, and a toothed wheel *j*, that gears into a pinion *k*, fixed

on the axis of the rotary-brush *a*, and also drives the pinion *l*, on the axis of the steel roller *b*; on the left-hand end of the shaft is fixed a pinion, which transmits motion through the toothed wheel *n*, to the wheel *o*, on the axis of the wooden roller *e*; and on this end of the shaft there is also fixed a mitre-pinion *p*, which communicates motion through the mitre-pinion *q*, shaft *r*, worm *s*, and worm-wheel *t*, to one of the rollers over which the endless cloth *f*, is extended,—thereby causing the cloth *f*, to travel in the direction of the arrow, and convey the cotton to the rollers *b*, and *e*. *u*, is a fly-wheel, fixed on the axis of the rotary-brush. *v*, is a sheet-iron cover, by which the rotary-brush is enclosed. The arrows indicate the directions in which the several rollers and wheels revolve.—[*Inrolled June*, 1849.]

To HENRY WALKER, *of Gresham-street West, in the City of London, needle manufacturer, for improvements in the process or processes of manufacturing needles.*—[Sealed 16th December, 1848.]

THE first part of this invention relates to the manufacture of crochet needles. In the ordinary mode of making these needles the hooked heads are formed by filing, and consequently no two needles are exactly alike; but the patentee manufactures the needles by means of dies in the following manner:—He takes round steel wire, of the proper thickness, and cuts it into pieces of the desired length, which he then anneals in a fire; and sometimes, before placing the pieces of wire between the dies, he grinds or reduces that end which is to be formed into the hook of the crochet to a blunt point, so as to leave as little waste metal as possible around the hook; or he reduces the size of the wire by drawing it through holes in a draw-plate—stopping when the required portion of the wire has been drawn through. In this manner he effects the reduction of the size of crochet needles intended to be inserted into handles—leaving the part which is to be inserted into the handle larger than the other part of the needle; or he flattens, by means of stamps and flat dies, the thicker portion of the wire; or, in some cases, he flattens the whole of the wire, with the exception of the part intended to be formed into the hook and that portion near the hook which regulates the size of the loop: the flat part then serves for a handle, and the other portion is reduced to the required size for the hook by the means above mentioned. The wire, thus prepared, is placed between a pair of dies, of the kind represented in plan

view and side elevation, at figs. 1, Plate XVIII.; which dies are operated upon by a stamp, such as is used for stamping sewing needles; and the end of the wire is thereby caused to assume the form shewn at fig. 2;—two needles may be formed at the same time from one piece of wire by using dies of the kind shewn at fig. 3. The waste metal that surrounds the hook is removed by a pair of clipping tools, formed accurately to the shape of the hook, as represented at figs. 4, and 5; or if they are to be used after the wire has been subjected to the action of dies of the description exhibited at fig. 3, then the clipping tools must be made double. Figs. 4, represent a plan view and side elevation of a hollow tool or die; and figs. 5, shew similar views of a punch to be used therewith. The hooked part of the wire is to be placed within the opening in the lower tool (fig. 4,); and then, on the punch being caused to descend, the hooked part of the needle will be forced through the lower tool, leaving the waste or superfluous metal on the top. Another mode of getting rid of the waste metal is to "eye" out (in the manner usually adopted in the manufacture of sewing needles) a hole or eye, as shewn at fig. 6, for the purpose of spitting or threading the needles side by side, in rows, and then removing the waste metal by filing, so as to produce a perfect hook, as shewn at fig. 7. After the removal of the waste metal, the needles will require to be hardened, tempered, and polished.

Another improvement in the manufacture of crochet needles consists in making holes through them and inserting therein and through the handle a fixed or moveable rivet, for the purpose of securing the needle firmly in the handle.

Figs. 8, 9, and 10, exhibit the tools employed for forming a knob on the heel or end of crochet needles, which is effected in the following manner:—The wire is placed in the recessed portions of the spring clamp, shewn, in plan view and side elevation, at fig. 8, (so much of the wire being left above the clamp as will be sufficient to form the knob); the clamp is firmly fixed between the jaws of a vice; and then the wire is "upset," by striking it with a flat or hollow hammer, so as to form the head or knob, which is afterwards rounded by means of the dies shewn at figs. 9, and 10. Fig. 9, represents the lower and fig. 10, the upper die.

The second part of the invention relates to the manufacture of the ordinary sewing needles, and consists in surrounding the pointing stone, at a convenient distance therefrom (and in a somewhat similar manner to that in which the ordinary tin or other metal cover is applied), with a blanket or other like

fibrous material, the top portion of which is kept moistened with water;—the supply of water being so regulated that the top of the blanket will be kept fully saturated, and the water will pass off gradually at the under surface of the blanket, where it is received by a suitable vessel: the effect of this arrangement is, that as the steel and stone dust strike against the wet blanket, they will adhere thereto, and will subsequently be removed therefrom by the water, as it passes into the receiver below. If the pores of the blanket become choked, the blanket should be removed and well rinsed.

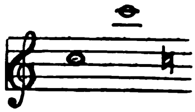
The patentee claims, Firstly,—the means above described for reducing the size of the wire used in the manufacture of crochet needles. Secondly,—the flattening of crochet needles in the manner above described. Thirdly,—the employment of tools in the manufacture of crochet needles of the several shapes shewn in Plate XVIII. and above described—whether such tools be used by hand or machinery. Fourthly,—the improvement in that part of the process of manufacturing needles known in the trade as "dry grinding" or "pointing" by the use and application to the grinding or pointing-stone of a blanket or other fibrous material, kept constantly moistened or saturated with water.—[*Inrolled June,* 1849.]

To JOHN CLINTON, *of Greek-street, Soho-square, in the county of Middlesex, professor of music, for improvements in flutes.*—[Sealed 16th December, 1848.]

THE first part of these improvements in flutes consists in giving motion to a distant key by the application of a bar, placed in a line with the edges of the finger-holes, in such manner that when a finger is placed on any of the holes the bar will be depressed and the key to which it is connected will be caused to close its hole.

In Plate XVIII., fig. 1, represents a flute laid open. *a,* is a bar, which moves on centres at *b, b*; it is connected to the key *c,* and lies close to the edges of the holes *d, d*; hence, when any of these holes are closed by the finger of the performer, the bar will be pressed down, and the key *c,* will consequently close the hole over which it is situated. This is merely given as an example; for the bar may be applied to other holes than those shewn.

The second part of this invention consists in so arranging the mechanism of a flute, that the closing of the C sharp and the B natural holes may be effected simultaneously by th

action of the second finger of the left-hand upon the B natural hole, directly or indirectly, at the same time leaving open the C natural hole if required. It has long been considered a great desideratum to obtain the "fingering" of the following notes,  similar to that of the ordinary flute, but with a proper arrangement of the holes as regards their size and distance apart, in order to afford the means of shutting the C sharp hole, and at the same time leaving open or opening the C natural hole, so as to obtain a full tone. When C natural is fingered thus O X O | X X X | 9 on the ordinary flute, the C sharp hole is open and the C natural hole is shut: whereas it should be just the reverse, in order to produce a good sound. The mode of effecting this may be varied; but the patentee states that he believes the two following modes will be found to be the best:—He arranges the mechanism so that the first finger of the left-hand shall act upon the C natural hole instead of the C sharp, as formerly; and the C sharp hole is placed at the side of the flute, with an open key over it, upon which the thumb rests when the flute is held in the usual manner: hence the fingering is obtained in the manner above mentioned. The C sharp key is placed between the centres that carry the B flat key, in order that the latter key may be opened by the least action of the thumb, and without acting on the C sharp key, as shewn at fig. 2.

The arrangement just described occasions a slight departure from the usual mode of fingering D on the fourth line and its octave; and therefore to retain those fingerings with the advantage before mentioned for C natural, the patentee employs the following means:—He applies open keys *e*, *f*, over the C sharp and the B natural holes, with a clutch to each: so that whenever the second finger of the left-hand is down, it will shut the C sharp hole by the clutch of the B natural key acting on the C sharp key; and as the C sharp hole is required to open for D natural (the second finger being also down for that note), he has applied a duplicate hole for C sharp, over which there is an open key e^1, acted upon by the third finger of the left-hand, in the manner about to be described. Over the A natural hole is placed a key *g*, mounted upon one end of the bar *h*, (which extends along the flute from this hole to the C sharp hole); and at the other end of the bar *h*, is fixed

an arm *i*, projecting on the opposite side of the centre: hence, whenever the A natural hole is open, the duplicate C sharp hole is closed, by the arm *i*, falling upon its key e^1; and when the A natural hole is closed, the duplicate C sharp hole is open. In order to admit of the duplicate C sharp hole being closed whilst the third finger remains down, a dumb key *j*, is applied in such a position as to come beneath the first finger; and when it is pressed down by that finger, the tail of it j^1, will elevate the tail of the key e^1, and so close the duplicate C sharp hole. The dumb key *j*, also acts upon the first-mentioned C sharp key *e*, and on the C natural key *k*, immediately below and in a line with it. The C natural key *k*, has a clutch, connected with another clutch, fixed to the tube that carries the A natural key; so that when the third finger is down, the A natural and C natural holes will be closed simultaneously. The patentee has removed the long C natural key (formerly a straight key) to the opposite side of the flute; bringing the ear of it within reach of the front finger of the right-hand, by means of an arm that crosses at the extremity of the G sharp key; and working both of these keys on the same rod and between the same centres.

The patentee does not confine himself to the above arrangement of mechanism, so long as the parts are so arranged that when any of the following combinations of the fingers are employed for C natural

	O	O	O	O	O	O	O	O
Left-hand	×	×	×	×	×	×	×	×
	O	O	O	O	O	O	O	O
	×	×	O	O	×	×	O	O
Right-hand	×	×	O	O	×	O	×	O
	×	×	O	O	O	O	O	×
D sharp key	ø	×	ø	×	ø	ø	ø	ø

the C sharp and B natural holes shall be shut, and the C natural hole be left open or opened: whereas, with the ordinary eight-keyed flute, if any of the above fingerings were used, the C sharp hole would be open and the C natural hole shut.

The patentee claims, Firstly,—the giving motion to a distant key by the application of a bar, placed in a line with the edges of the finger-holes, and in such manner that when a finger is placed on any of these holes the bar will be depressed and the key to which it is connected will be acted on. Secondly,—the so arranging the mechanism of a flute that the

closing of the C sharp and B natural holes may be simultaneous, leaving open or opening the C natural hole when the fingerings above given are required.—[*Inrolled June, 1849.*]

To Thomas John Knowlys, *of Heysham Tower, near Lancaster, Esq., and* William Fillis, *of Shirley, in the county of Hants, merchant, for improvements in generating, indicating, and applying heat.* [Sealed 5th April, 1848.]

This invention consists, firstly, in generating and applying heat to ovens and drying or other chambers, and to steam and other boilers and vessels containing fluids; secondly, in applying pyrometers to ovens employed for baking bread and other food; and thirdly, in a mode of constructing and working roasting-jacks.

In Plate XVIII., fig. 1, is a front view of a kitchen range, constructed according to this invention; fig. 2, is a plan view thereof, with the top-plate removed; fig. 3, is a longitudinal section; and fig. 4, is a transverse section. *a*, is the fire-place, the fuel in which burns from the surface, without any supply of air passing up through the bottom; and the bottom may be a fire-tile, or it may be a grating of bars; but in the latter case the ash-pit must be kept closed, and only opened when it is required to move the ashes. The object which the patentees desire to attain is to cause the fuel to burn from the upper surface;—the heated products from the fire being conducted away laterally, and made to descend beneath the oven *b*, and thence pass away at *c*, to the chimney: by this means the oven will be heated from above, then on the sides, and then at the bottom, by a downward draft; and the peculiarity is in the placing of the fire above the oven. The patentees state that the use of a downward draft to heat ovens is not new. They prefer to make the oven of fire-tiles or fire-clay; but it may be made of any other suitable material. At the front of the fire there is a grating or set of bars, in order that it may be used for roasting; the upper part of the fire is covered with a plate, shewn at *d*, in fig. 4; and the whole of the upper surface may be used as a hot plate to receive culinary vessels. *e, e,* are the oven-doors, which are provided with glass handles, as they will not become so hot as iron handles.

Another part of the invention consists, as stated above, in applying a pyrometer to ovens used for baking bread and

other food, with a dial and pointer, (as shewn at *f*, fig. 1,) or other means of indicating the degree of heat at which an oven may be; so that the attendant may cool the oven, if it should be getting too hot. Any convenient construction of pyrometer may be used: the most simple for the purpose is that made by combining two different metals, as the extent of heat required for baking is not great; but tubes or vessels containing metal which will fuse at the desired temperature for baking, and others containing metal which will fuse at a temperature some degrees higher, may be used in place of the pyrometer formed by the combination of two different metals;—when these are employed, it will be known that the oven is getting too hot if the last-mentioned metal is found to melt; and the proper heat will be indicated when the other metal is in a molten state, while the higher melting one remains unmelted.

g, (figs. 2, 3, and 4,) is a boiler for heating water, forming part of the kitchen range; and to it is applied a separate compartment *h*, having within it a wheel, formed like the measuring-wheel of a wet gas-meter, and partly immersed in water, which is kept at the desired level in the compartment *h*, by the connection of the latter with the boiler. The steam generated in the boiler is caused to pass through the compartment *h*, and give motion to the wheel; and from the axis of the wheel motion is communicated to a spit, by any suitable mechanical means. The patentees state, at this part of their specification, that they have not thought it necessary to shew the arrangement of the roasting-jack, as it is like a gas-meter, which is well known.

Fig. 5, exhibits a vertical section of an oven. *a*, is the fire-place; *b*, is the oven; *c*, is the flue leading to the chimney; and *d*, is a perforated cover of fire-brick, or other suitable material, through which the requisite supply of air for supporting combustion is admitted, as there are no openings at the front of the fire-place. Chambers for drying various matters may be heated in this manner—the fire being on the upper part, and the flues so arranged as to conduct the products of combustion off laterally, then downwards, and thence away to a chimney.

Fig. 6, represents a vertical section of a steam-boiler, with this invention applied thereto. The fire-place *a*, is situated within the boiler, and does not require a grating at the bottom for the passage of air; but if a grating is used, then there must be a closed ash-pit to receive the ashes. The heated products from the fire pass off laterally, and descend to the flue *c*, as

indicated by the arrows; the space above the fire is open; and there is an opening through the boiler at either end for the passage of air above the fuel: it will therefore be evident that, in addition to the heat of the fire acting on the water in the boiler which is directly over the fire, the heated products will descend and present, as it were, a thin film of heat to the water in all directions. The patentees state that this mode of constructing and applying apparatus for burning fuel will be equally applicable to open boilers; and that the flues, after passing down from the fire, may again ascend and pass through the fire; so that the exterior of the flue or flues may be acted on by the fire, and the draft through the flues thereby rendered more powerful: this method of arranging the flue or flues may be adopted when other places or chambers are to be heated. To prevent any black smoke from issuing from the chimney, perforated partitions of fire-tile *b*, are fixed across the descending flues; and as the products of combustion pass down through such partitions, the black unconsumed carbon will be burned by coming in contact with the highly-heated fire-tiles. The patentees remark, that they are aware that open brickwork has before been built in flues for a like purpose; but perforated fire-tiles are more suitable. They prefer that the surfaces on which the fuel is burned should be made of fire-clay; but this is not absolutely essential; and although the flame and heated gases are represented as passing off on either side of the fire, the same may pass off only on one side.

The patentees claim, Firstly,—the improvements above described for generating heat and applying heat to ovens, drying and other chambers, and to boilers and other vessels containing fluids. Secondly,—applying a pyrometer to ovens used for baking bread and other articles of food. Thirdly,—the mode of constructing and working roasting-jacks above described.—[*Inrolled October,* 1848.]

To THOMAS JOHN KNOWLYS, *of Heysham Tower, near Lancaster, Esq., for improvements in the application, removal, and compression of atmospheric air.*—[Sealed 2nd November, 1848.]

THE first part of this invention relates to the application and removal of atmospheric air in the roasting of coffee, chicory, and other materials used with or instead of coffee, and cocoa.

The patentee states that the roasting of coffee, chicory, and

cocoa, has been usually performed in metal cylinders; but vessels made of other materials have been employed; and in all cases where revolving vessels have been used, they may be said to have been close vessels, with the exception of a few small passages at one end for the exit of the heated products. Now the patentee employs a cylinder or other suitably-shaped vessel, extensively perforated, and made of earthenware, fire-stone, or of metal coated with enamel or vitreous substances: by this arrangement, the heated air to roast the coffee, &c., will pass freely into the vessel, and the vapours and heated air will pass freely off through the numerous holes. He prefers earthenware vessels, and recommends that the shape should be octagonal, hexagonal, or angular in some form; although a cylinder, or even perforated trays, may be used. The perforated vessel rotates slowly on its axis, in an oven or such like chamber, made of fire-tile, brick, or iron, and heated externally, so that the atmosphere within shall be kept at the requisite temperature for roasting coffee, &c.; suitable means of admitting air into the oven are provided; and a pipe leads from the oven into the flue of the fire-place, by which the latter is heated, so as to carry off the heated air and products from the coffee, &c. The heated air will pass freely through the perforations into the vessel and act on the coffee, &c.; and, at the same time, the heated air, with the products from the coffee, &c., will be removed with facility from the interior of the revolving vessel. Instead of revolving vessels, perforated trays may be used;—the coffee being moved either by giving motion to the trays, or by rakes or other suitable apparatus.

The second part of this invention relates to part of an invention patented by the present patentee and W. Fillis, April 5, 1848; in the specification of which patent the patentees describe means of causing fuel to be burned without the passage of air between the bars, or through the surface on which the fuel is supported. The patentee has since discovered that, when the surface to support the fuel is composed of fire-tiles, fire-bricks, or fire-stone, a downward draft may be obtained, by forming numerous slits or perforations through the fire-bricks, tiles, or stone, in place of causing the products of the fuel to rise over the sides of the fire-place, and then to descend, as described in the above-mentioned specification. For this purpose, instead of allowing the fuel to burn wholly from the surface, the supply of air descends through the fuel, and the products from the fuel pass through the narrow slits

or perforations in the fire-bricks, tiles, or stone, on or against which the fuel is supported.

The third part of this invention consists in causing air to be compressed by any suitable machinery, and forced through hollow fire-bars, whereon anthracite coal is being consumed, so as to obtain heated air, and to prevent the fire-bars from being injured by the great heat produced in the combustion of anthracite coal. The heated air, thus produced, may (when an intense fire is required) be passed into and blown amongst the coals on the fire-bars; or it may be employed in any processes to which it may be applicable.

The patentee claims, Firstly,—the means, above described, of applying and removing heated air in the roasting of coffee, chicory, and other materials used with or as a substitute for coffee, and cocoa, by employing the materials above described, perforated with numerous holes. Secondly,—the improvements in constructing furnaces above described. Thirdly,—the improvements in compressing and applying air, by forcing the same through fire-bars on which anthracite coal is burning, so as to preserve such bars and obtain heated air.—[*Inrolled May,* 1849.]

To James Robertson, *of Liverpool, in the county of Lancaster, cooper, for a mode or modes of consuming smoke and other gaseous products arising from fuel and other substances.*—[Sealed 2nd November, 1848.]

This invention consists, firstly, in constructing furnaces for heating boilers or other vessels with a series of tubes, situated outside the boiler or vessel, and so arranged as to occupy the space commonly occupied by the external flues or passages,—the said tubes, and the spaces left in piling them against or over each other, being the course of the smoke, gases, heated air, &c., from the fire to the chimney. This part of the invention also consists in supplying the smoke or other gaseous products with air, whilst such smoke and gaseous products (being in a highly-heated state, and divided into small streams by the said tubes) are in a condition to be readily consumed by the intermixture of oxygen from the atmosphere or other source.

Secondly, this invention consists in constructing furnaces for heating boilers and other vessels and stoves, fire-places, or similar apparatus for heating buildings, rooms &c., with a

series of horizontal or nearly horizontal tubes, placed over or behind the fuel; such tubes having an opening or openings in their upper sides, and one or both of their ends communicating with the external air; so that oxygen from this source may be supplied in a heated state, and in thin streams, to the smoke and other gaseous products, and may effect the consumption of the same, by mixing therewith whilst the smoke and other gaseous products are somewhat divided, by being obliged to pass between the said tubes in their course to the chimney or flue.

Thirdly, the invention consists in consuming the gaseous products arising from noxious or offensive matter in sewers, drains, abattoirs, or other places where such matter may exist—that is to say, destroying the noxious or offensive qualities of such products, by causing them to pass through a series of heated tubes or passages.

In Plate XVIII., fig. 1, is a vertical section of a steam-boiler furnace, constructed according to the first part of this invention. *a, a,* are tubes, which extend from near the back end of the fire-bars to the end of the boiler, and occupy the whole interior of the flue; so that the smoke and gaseous products from the fire must pass through these tubes (which are open at each end) to reach the chimney *b*: the tubes are made, by preference, of fire-clay; but they may be manufactured of iron or other suitable metal. Just before the front ends of the tubes *a*, is a row of vertical metal tubes *c*; in each of these tubes, at the side thereof nearest to the tubes *a*, is formed a slit, as shewn at fig. 2, or a series of holes, as shewn at fig. 3; they are closed at the upper end and open at the lower end, which is carried down into the ash-pit or to the outside of the furnace; and by this means the air is caused to enter into and mix with the smoke and gaseous products passing through the tubes *a*, for the purpose of causing the combustion of the same. *d*, is a trap or valve, for admitting air through the passage *e*, to the extremities of the tubes *a*, nearest to the chimney, in order to effect the consumption of any of the smoke or gaseous products which may not have been consumed in the tubes *a*. If preferred, the tubes *c*, may be arranged horizontally or in an inclined direction.

The mode of carrying out the second part of the invention is shewn at figs. 4, and 5.—Fig. 4, is a side view of a stove, and fig. 5, a front view of the same—the front plate having been removed. *f, f,* are tubes, which are fixed in a horizontal position across the upper part of the stove; they are open at each end to the atmosphere, and have slits or holes formed

in their upper surfaces, like the tubes represented at figs. 2, and 3; and, consequently, the air which enters the tubes will be caused to mix in thin streams with the smoke and gaseous products from the burning fuel and effect the consumption of the same.

In order to consume or destroy the gaseous products arising from noxious or offensive matters, the stove represented, in vertical section, at fig. 6, is employed. *g*, is a metal chamber, fixed at the back of and beneath the fire-grate *h*, and communicating by a coiled pipe or pipes *i*, with the chimney or flue. The heat of the fire will cause a strong draft through the pipes *i*, and as the chamber is connected with the receptacle containing the noxious or offensive matters, the gaseous products from the latter will ascend into the chamber and thence pass into the pipes, which, being in a highly-heated state, the gases will be consumed or destroyed. The arrangement of air-pipes *f*, (shewn at figs 4, and 5,) for consuming the smoke and gaseous products from the burning fuel, may also be applied to the stove shewn at fig. 6.

In conclusion, the patentee states that he does not claim the exclusive use of any of the separate parts above described for the purpose of consuming smoke or other gaseous products, except when the same may be or are employed in connection with his said invention, which he declares to consist of the three several parts above set forth; and he therefore claims the mode or modes of consuming smoke and other gaseous products arising from fuel and other substances, as above described.—[*Inrolled May*, 1849.]

To Thomas Drayton, *of Regent-street, in the county of Middlesex, practical chemist, for improvements in silvering glass and other surfaces.*—[Sealed 4th December, 1848.]

This invention relates to the process of silvering glass without the use of quicksilver, for which Mr. Drayton obtained a patent, November 25, 1843*. It consists in causing silver to be deposited from a solution of that metal upon glass, in such manner that a precipitate of silver will adhere to the glass without any previous coating being applied thereto; and it also consists in coating other substances with silver in the same way.

The mode of carrying out the invention is as follows:—

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* For description of this invention see Vol. XXIV of our present Series, p. 421.

One ounce of hartshorn or ammonia, two ounces of nitrate of silver, three ounces of water, and three ounces of spirit (spirit of wine being preferred), are carefully mixed together; the mixture is allowed to stand for three or four hours; and then it is filtered. To each ounce of the filtered fluid is added a quarter of an ounce of saccharine matter, dissolved in equal parts of spirit and water,—say about half a pint of each. The patentee states, that the saccharine matter which he prefers to use is grape sugar,—the solution being allowed to stand for a few hours. The liquid may be used for depositing silver either upon horizontal or vertical surfaces, provided it is kept in contact with the glass, which is to be kept heated to about 160° Fahr., until the required deposit of silver has been obtained. As soon as the silver upon the glass is perfectly dry, it may be varnished with common mastic varnish, to preserve it from being injured by friction.

The patentee states, that this invention may be employed for depositing silver upon looking-glasses and every other description of glass, either hollow or having a flat surface. The process is not at all unhealthy or injurious; and no smell of any kind arises during the operation of silvering, or after the glass has been silvered. The superiority of this process over the ordinary one consists in the production of a coating of silver of great durability, and capable of withstanding heat as well as damp to a very extraordinary extent. It is stated, that the solution will deposit silver upon metals in a very perfect manner.

The patentee does not confine himself to the precise details above described, provided the peculiar character of the invention be retained, whereby silver is deposited on to glass from a solution of that metal, in such manner as to cause the silver to adhere to the glass without any previous coating of the latter, and without the use of oils.—[*Inrolled June*, 1849.]

Scientific Notices.

ON PATENT LAW REFORM.

ARTICLE VI.

In the preceding papers we have attempted to shew wherein the defects of our system of granting to inventors a property in their ingenuity consist; we shall now, in this, the last paper of the series, offer some suggestions for the amendment of the patent laws,—bearing in mind that, whenever pecuniary

interests are bound up with, and are dependent upon, the maintenance of an existing system (however inadequate that system may be to the accomplishment of the purposes for which it was instituted), there is much less difficulty in modifying it, by the introduction of improvements, than in supplanting it by a new one. The result of our enquiry into the working of the patent laws may be thus briefly stated:—Sufficient encouragement is not given to the inventor to pursue his calling and work out the destiny of civilization. Whoever, therefore, is of opinion that these laws already confer ample benefits upon the inventor, must of necessity be opposed to all the suggestions which we shall advance; for they are each designed to correct some defect or abuse, which acts, directly or indirectly, as a discouragement to the healthy exercise of the inventive faculty; and they would, as we believe, severally tend to better, in some degree, the inventor's prospects. We shall not, at present, stop to combat the opinions of those who, by opposing the advancement of the cause of patent law reform, would indicate a desire to retain the abuses under which inventors have so long suffered; but we shall proceed to shew how, in our opinion, they may be remedied. As a preliminary, however, to these remarks, it may be useful first to recapitulate the defective points of the system, as set forth in the former papers, that the applicability of the suggested remedies may be the better estimated. These we will give in the order in which they were previously noticed; they are as follows:—

1st. Letters patent express that the grant is conferred as *a matter of grace and favor*. A privilege, thus obtained, can therefore only be looked upon as a *reward,* instead of *the acknowledgment of a natural right;* and thus the property of the inventor is deprived of the protection derivable from the moral force of public opinion, which assists so effectually in securing all other kinds of property to their rightful owners: mere legal protection can never make amends for the want of this species of guardianship.

2nd. The cost of securing inventions, by letters patent, acts as a bar to a vast number of ingenious men, in bringing forward their discoveries; while many, who have found means to meet the outlay, have thereby exhausted their slender resources, and rendered themselves unable to introduce their improvements to public use, for want of funds.

3rd. The titles of patents are frequently so indefinite and ambiguous, that it is next to impossible to make an effectual search amongst prior patents, with the view of ascertaining

the novelty of any given invention; as the object of an invention, in many instances, cannot be traced from the title.*

4th. The present system of granting patents admits of there being crammed into one specification a number of distinct inventions for dissimilar objects, emanating not merely from the patentee but from other inventors: in fact, the high fees render it necessary that some such plan should be adopted by the patentee, to assure himself of the patent paying its expenses.

5th. The poor inventor cannot, without the risk of losing his invention, gain the assistance of a capitalist in carrying it out; from his being unable, until the whole expenses of the patent are paid, to gain even a temporary protection, which would secure him from the danger of a fraudulent betrayal of of his secret; while the capitalist is deterred from making pecuniary advances in this kind of speculation, because he can obtain no legal hold upon the invention, unless he declares that he is part inventor, and thereby makes himself a co-patentee.

6th. The right of two claimants (patentees) to a patented invention is not determined by the priority of application for their patents, but by the priority of date of the Great Seal,—the obtaining of which usually takes a month; if, therefore, two parties, making applications for patents simultaneously, are in possession of the same invention (the details of which, we will suppose, vary sufficiently to induce the Attorney-General, on a hearing, to issue his report on both petitions), the invention will become the exclusive property of him who, in addition to having secured the services of an expert patent agent, is most lavish of his money in the payment of extra fees for expedition and private seals.

7th. Applications for patents may be carried up to any one of the several stages of the patents' progress, and be there left for years; the applicant having the power, at any future time, to push forward his patent to the Great Seal, by paying up the remaining fees. The number of unfinished patents is increased annually by about two hundred; and in case a party is stopped by a successful opposition, or fears such a result, he has only to make an amicable arrangement with the proprietor of some one of these unfinished patents to specify his invention (his patent having of course a suitable title), when

* An instance of this is given at page 410, the title being "improvements in the application, removal, and compression of atmospheric air;" while the invention consists in an improved method of roasting coffee and economising fuel in furnaces.

a patent that has passed the stage of opposition can be pushed to the seal, without the knowledge of the party whose opposition he feared, and that, before such party could possibly secure himself by completing his own patent.

8th. Three distinct patents are required to secure an invention in the United Kingdom; and, if either of these patents is sealed after the inrolment of the specification of the invention in one of the three kingdoms, such post-dated patent may be presumed to be invalid; but, if the invention, when patented in one kingdom, is worked, to test its value, prior to the other patents being obtained, those patents, when obtained, will certainly be invalid: thus, before he can possibly ascertain that the public is likely to appreciate his discovery, an inventor must incur the heavy expense of three patents, if he is desirous of securing his rights in the United Kingdom; and, after all, his discovery may prove useless.

9th. If a party has fraudulently possessed himself of an invention, and secured it by patent, there is no means of dispossessing him of the patent right and conferring it upon the true inventor.

This is a summary of the chief defects of the patent laws, by which the inventor, instead of being protected in his natural rights, and stimulated to increased exertions, is too often robbed of the benefits resulting from his ingenuity, or effectually prevented from applying his discoveries to the use of either the public or himself. But there are some other discouragements to inventors than those above mentioned, which, although of minor importance, should not be overlooked in an enquiry of this kind. The first is, the uncertainty which is felt by an intending patentee, respecting the novelty of his invention, from there being always about two hundred and fifty patents, the specifications of which (six months being allowed for the patentee to specify) are not inrolled, and cannot therefore be examined. Now, in the specification of some one of these patents may hereafter be found the identical discovery, the novelty of which, an inventor, after a patient search through heaps of musty records, had so satisfied himself of, as to be induced to seal a patent for the same. In such a case, which happens not infrequently, the second patentee, although having used all due caution, loses the whole expenses of his patent. The second point is, that inventors' interests may greatly suffer by the premature appearance of their specifications in print. It is now very generally the practice with English patentees, to secure their inventions, by patent, on the continent,—owing to the very moderate fees demanded in France, Belgium, and elsewhere, for such protection; if,

however, a description of the invention has been published prior to the date of applying for a continental patent, the grant will either be refused (as in Prussia), or the validity of the patent, when granted, will be liable to be successfully disputed hereafter. But, as specifications are open to public inspection immediately they are inrolled, any one is at liberty to read them, and publish their contents forthwith; and, indeed, there are parties who make a practice of publishing, week by week, as the specifications fall due, abstracts thereof, which, however incomprehensible to their readers, are, in general, sufficiently explicit, when compared with a copy of the original specification, to shew that something like the invention therein set forth has been made known to the public in a printed book,—and thereby to throw grave doubts upon the validity of a patent obtained after such publication. For the removal of these minor inconveniences we shall also offer some suggestions.

The design of our proposed amendments on the practice of granting patents is not to uproot the whole system, but merely to lop off such excrescences as are of no service to the public, and only add to the delay and cost of the proceedings. With the view, then, of removing only what is decidedly objectionable, and rendering our suggestions as little open as possible to opposition from interested quarters, we propose to retain the present mode of applying for the patent; and also the practice of referring the application to the Attorney or Solicitor-General; but the several stages of the patent's progress, from the issuing of the report to the sealing, we propose to sweep away,—making the report itself a sufficient warrant for the Lord Chancellor to order the sealing of the patent. The present mode of procedure, with respect to oppositions on the report, we propose to retain; and, generally, with respect to the granting of patents, we propose that the services of the functionaries in Edinburgh and Dublin be dispensed with, and that the whole business be transacted by but one set of officials in London. In putting forth the following propositions, which we consider would meet the several difficulties above enumerated, and thereby confer a great boon upon the manufacturing interests of this country, we would wish to disclaim the credit (should any result) of their having originated exclusively with ourselves; for they have, for the most part, little claim to novelty; but what we should feel no hesitation in taking upon ourselves is, the risk of having recommended a practicable or impracticable scheme of patent law reform.

PROPOSED AMENDMENTS.

1st. That patents shall be held on the same tenure as heretofore, viz., as royal grants; but that the terms of the grant shall be changed, so as to shew that *justice*, and not *favor*, is the motive for conferring such privileges. [By this means, it is presumed, that the feeling of jealousy, which too generally exists in the public mind against patentees, will be, in great part, removed.]

2nd. That in place of the three patents which are required to give an inventor the sole right to work his improvements in the United Kingdom of Great Britain and Ireland, the Colonies, and Channel Islands, the limits of all patents, hereafter granted, shall be—the British Empire. [By thus extending to the utmost the sphere of the patentee's operations, he will have an inducement to push his invention in those parts of the empire where (as shewn by Article V.) its use must now, in most cases, be of necessity unknown.]

3rd. That the cost of a patent for fourteen years shall be reduced to £30; and that patents for a term of five years shall be granted for minor inventions, at a cost of £10. [This reduction in the cost of patents would, by holding out a prospect of reward to ingenuity, confer incalculable benefits on inventors generally, and, consequently, increase the prosperity of the manufactures and commerce of the country;—enabling Britain, through the uncrippled energy and unrivalled skill of her sons, to compete successfully with the world in every branch of the manufacturing arts. The granting of short and cheap patents would allow of that legislative abortion—the Act for registering articles of utility—being swept away.]

4th. That a patent shall, in no case include more than one invention, or one improved manufacture—that is to say, a patent shall protect one invention, whether it be applied to one or more manufactures; or it shall protect one improved manufacture, whether such manufacture be effected by one or more inventions. [On the adoption of this proposition, it would be possible to ascertain the object of an invention by reading the title of the patent; which facility is of the utmost consequence in conducting a search among old patents, with the view of discovering what has been already done in any given manufacture.]

5. That all applications for patents shall, as heretofore, be made at the Secretary of State's Office, and be subject to the present fee; and that such applications shall be referred to the English Attorney or Solicitor-General for their consider-

ation; at whose office a fee of £10 shall be paid on every application for a fourteen years' patent, and £5 for a five years' patent,—one-half of which sums, respectively, shall be remitted, in case the application is finally rejected.

6th. That the patent shall bear date from the day on which the inventor's application is received at the Attorney or Solicitor-General's office; and that, with such application, shall be deposited a preparatory specification of the invention sought to be patented. [This, in connection with amendment No. 7, will prevent the carrying on of the frauds before mentioned, and will ensure to the inventor his right to protection.]

7th. That, as an appendage to the office of the Attorney and Solicitor-General, a board of examiners, consisting of not less than three scientific men, shall be appointed; whose duties shall be to enquire into the sufficiency of every preparatory specification that is deposited, and assist the Attorney and Solicitor-General in coming to a right decision in cases of opposition.*

8th. That the examiners shall be empowered to reject such applications as are not accompanied by a clear description, setting forth the nature and object of the invention—to refuse all applications which include more than one invention—and to apprise applicants that their inventions are anticipated, when such is the case. [These provisions will ensure, 1st, that no purposely-mystified description could be deposited under the idea of getting more scope for the insertion of additional improvements in the complete specification; 2nd, that the advantages contemplated under amendment No. 4, will be realized; 3rd, that an inventor will have a means of ascertaining whether the invention for which he is soliciting a patent is or is not the subject of an unspecified patent.]

9th. That the Lord Chancellor shall be empowered, on receiving the report of the Attorney or Solicitor-General, to order the patent to be prepared, and the Great Seal to be affixed thereto.

10th. That the third payment, making up the cost of the patent to £10 or £30, respectively, shall be paid into the Great Seal Office within one month from the day on which the application was made, and that, before the patent is sealed:

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* To secure efficient examiners, we should suggest that they be appointed by, and be subject to dismissal from, the crown lawyers, who would personally feel the inconvenience of having incompetent parties in such a capacity; and would therefore be careful whom they appointed: the remuneration of these officers we should limit to about £500 per annum each.

in default of payment the application to be considered as withdrawn.

11th. That any party becoming honestly possessed, by purchase or otherwise, of an invention, whether emanating from a British subject or a foreigner, shall be at liberty to obtain a patent for that invention in his own name, provided the inventor's name be recited in the patent. [This will render patent property a far safer investment for capitalists than at present; and will, consequently, enable poor inventors to find pecuniary assistance more readily than heretofore.]

12th. That in case a party has fraudulently obtained a patent for the invention of another, it shall be competent for the Lord Chancellor, on the matter being brought judicially before him, to order a transfer of all rights in the patent to the first and true inventor. [By the adoption of this clause, it will not be necessary, in order to undo one act of injustice, to commit another; for, instead of the inventor being benefited by the cancelling of a patent fraudulently obtained for his discoveries, it is by the present plan the public who are advantaged,—for the invention then becomes public property.]

13th. That the stamp duty on specifications shall be removed, and that the preparatory specifications shall be also recorded at the office where the complete specifications are inrolled.

14th. That for the six months next ensuing from the inrolment of his specification the patentee shall have the exclusive right to print a description of his invention. [This will secure him from the inconvenience and loss to which he is at present subject, if he cannot apply for his foreign patents before his English specification is inrolled.]

These then are the means whereby we propose to place inventions on an equal footing with all other properties recognized by the law of the land. We are fully aware that each suggestion will meet with its opponents; and that, where wit sufficient to raise a single plausible objection is wanting, the whole plan will be unceremoniously condemned as impracticable. If, however, to the candid enquirer any thing incongruous should appear in our proposed amendments, we would not have him condemn before he has considered whether the seeming incongruity is consequent on hasty writing, or the expression of a hasty judgment. For our own part we have not such confidence in our powers as to think that in the treatment of a subject which has baffled the skill of so many

to compass, we should of necessity be eminently successful; but we do believe, that with our practical knowledge of the evils of the existing system of granting patents, it would be exceedingly unlikely that we should—in selecting from a mass of suggestions those which, for the most part, in their isolated state, have been approved of by parties whose opinions are well worthy of attention—have collected a set of notions which, when worked together, would make a wholly impracticable and inoperative scheme. If, however, such should prove to be the case, we shall at least have the satisfaction of knowing that we have again drawn public attention to a subject which, in national importance, falls little short of that much agitated commercial question, "free trade." We may be asked,—If your reform measures were carried, how would you compensate the present place-holders for their loss of income? Our answer would frankly be,—we have no plan for that; for all compensation business is much better left in the hands of government, who have hitherto shewn much ingenuity in creating opportunities for the application of their skill in that department of political science. We should hope that the time is past for retaining an acknowledged abuse at the cost of starving industry, merely for the sake of feeding in idleness the Clerks of the Signet and Privy Seal Offices, the Clerk of the Patents, and the Clerk and Deputy Clerk of the Hanaper;—all of whom make no pretension to do more than take their salaries; and might, with as much justice, be provided for by a tax laid on the country for their especial uses, as by being allowed to suck up the hard-earned money of the poor patentee. The income raised from patents, at the proposed reduced cost, would, we believe, far more than cover the expenses of the grant: the surplus might be paid into the Exchequer, or appropriated in any useful way that might be hereafter devised. That the annual number of patents would considerably increase, on the cost of the grant being reduced, there can be no doubt; but that any inconvenience would arise therefrom,—rendering it impossible for a manufacturer to know what he could and what he could not use, without infringing upon some patent, that we do not believe. It is at present (as we have shewn) next to impossible to discover what is already patented; for many inventions, having little or no connection with each other, are heaped together in one patent under an ambiguous title; but, by amendment No. 4, this would be effectually prevented; and perhaps a mass of inventions, now capable of being included in one patent, would then be made the subjects of half a dozen. Thus the revenue

would suffer comparatively little from the reduction of cost, and the public would be better able to discover what inventions really were patented. This latter advantage would be further secured by the establishment of an official journal, wherein copies or intelligible abstracts of the specifications of all patents should appear. A work of this kind might also form a convenient vehicle for publishing the list of patents sealed, notices of applications for disclaimers and amendments of parts of titles and specifications, applications for extensions of patents, and other like matters connected with patents. Finally, we would remark that, although by putting forth an entirely new scheme we might have made our suggestions for patent law reform look more promising upon paper, yet, considering the difficulties of moving the legislature to the adoption of wholesale alterations, we think that our less ambitious course has the advantage of prudence. In both cases we could but have met the difficulties lying in the inventor's path; and this we believe we have already done, by our proposed amendments. If our efforts to obtain a reform of the patent laws should tend to the enactment of such a law as would effectually protect and encourage inventive genius, the satisfaction we should derive from the result would far more than repay us for our labors.

ON THE METHOD OF BURNING PLASTER OF PARIS BY MEANS OF HEATED STEAM.

BY M. H. VIOLETTE.

[Translated for the London Journal of Arts and Sciences.]

The manufacture of plaster is one of the most important manufactures in Paris, in consequence of its numerous applications to various purposes, such as building, moulding, statuary, the manufacture of stuccoes and artificial marbles and stones, and for agricultural purposes; for which latter purpose considerable quantities are used.

The conditions necessary for the burning of plaster are well known; there are, however, many inconveniences attending the ordinary process, such as unequal burning of the stones in different parts of the ovens, the charges being calcined either too much or too little; and, finally, the substance is tarnished by smoke and dust. Attempts have been made, it is true, to burn plaster in coke ovens; other means and apparatus have also been used, such as first pulverizing the material and then calcining it, by the direct action of fire, in fixed or moveable apparatus, made of sheet-iron, &c. The principal objection, however, to the employment of these apparatus, which produced a better article

than ordinary, is, that there is a difficulty in regulating and determining the temperature. It is an uncertain operation, producing results both variable and costly: besides which disadvantages, the extent of the manufacture is limited. The novel process about to be described possesses all the conditions necessary for the proper performance of the operation, and is at once simple and certain.

The calorific agent employed, according to this plan, as a substitute for wood or coal fire, and which acts upon the stone in a perfectly satisfactory manner, and within a certain determinate period, is steam; which is heated to the degree necessary for that purpose, by passing it from the generator through a coil of heated pipe. The apparatus is composed of an ordinary steam generator or boiler, a coil of metal pipe, and a series of receivers (for containing the stone to be converted into plaster), of an oval form, somewhat similar to a lime-kiln, and having openings at top for charging, and at bottom for discharging; which openings are capable of being hermetically closed. A communication is established between these different parts of the apparatus by means of pipes, furnished with stop-cocks; and a thermometer, placed near the receiver, indicates the temperature of the steam before it enters the receiver.

The mode of operation is as follows:—The steam passes from the generator into and through the coil, where it becomes heated to the degree required,—enters into the first receiver, and thoroughly pervades the whole mass of stone contained therein, heating and burning it gradually and equally; after which it passes into the next receiver, and from thence escapes into the atmosphere, carrying with it, by reason of its high temperature, all the humidity present. It will be understood that the operation is not perfectly performed in both these receivers by one current of steam, as the steam, after having acted in the first receiver, no longer retains sufficient heat to act efficiently in the second; it will, nevertheless, serve to prepare the material contained therein for a further operation; and thus, the heat retained by the steam, after operating in the first receiver, may be usefully employed, instead of escaping therefrom into the atmosphere.

When the operation is completed in the first receiver, the direction of the steam is reversed, and directed first into what was before the second receiver, where it completes the operation upon the partially prepared material, and passes thence into the next receiver, where it prepares the material as before; and so on, the direction of the current of steam being reversed at each operation. It will, of course, be understood, that one of the receivers must be discharged and re-charged at each operation.

The notion of drying or burning plaster by means of steam, may at first seem rather extraordinary; but all surprise will cease, on considering that steam, heated to a temperature of 200°, is nothing more nor less than a gas, which, by reason of its high

temperature, readily absorbs moisture from any body with which it may be brought into contact.

M. Violette states that he at first made use of an apparatus which he had set up at the powder works at Esquerdes (of which he is the manager), for the purpose of carbonizing wood by means of heated steam, and which was found to produce charcoal of very superior quality for the purpose of making gunpowder.*

In this experiment M. Violette introduced into the carbonizing cylinder (which is of a capacity of 0^{mc},180) 150 kilogrammes (about 300 lbs.) of gypsum, broken into cubical pieces, of about from 10 to 15 centimetres (4 to 6 inches) in diameter. The quality of the stone varied very considerably,—from that which is yellow, soft, friable, and easily baked, to that which is hard, compact, crystalline, and difficult to burn. The steam was caused to circulate at a pressure of half an atmosphere only, and during the whole operation kept at an even temperature of between 190° and 200°. The quantity of steam which was caused to circulate in the apparatus was about 20 kilogr. per hour. The experiment was carried on for nine consecutive hours; at the expiration of three hours the apparatus was opened, and specimens drawn out from various parts of the charge. Specimens were again obtained at the expiration of six hours; and at the end of the nine hours the charge was drawn and weighed,—allowance having been made for the specimens previously withdrawn. The stone was found to have lost 18 per cent. of its weight, which shewed that it was perfectly operated upon; this was also indicated by its dazzling whiteness and friability, and by its feeling unctuous and flour-like to the touch. M. Violette did not, however, rely upon these appearances, but took other more certain means of ascertaining the quality of his new plaster.

It should be observed, that good plaster of Paris will absorb three-fourths of its weight of water, combine with it, and become firm and hard in the course of a few minutes. The process which M. Violette employed was as follows:—He mixed 10 grammes of finely pulverized and sifted plaster with 32½ grammes of water, stirred, and left it to settle. If the plaster does not acquire consistency, but falls like sand to the bottom of the water, it is either not burnt enough or too much burnt; *i.e.*, it is quite unfit for use; if it is soft, the plaster is of middling quality, and the quantity of supernatant water indicates the proportion improperly baked. If it becomes hard and firm, and is free from supernatant water, the plaster is perfect.

M. Violette compared his improved plaster with the best kind of builders' plaster made in Paris, and also with the best kind of plaster of Paris used for casting, and the result of his comparisons was as follows:—1st. That his plaster, baked in steam for three hours, combined with water in the same manner as the ordinary

* For a description of this apparatus, see Lon. Jour., Vol. XXXIV., p. 50.

builders' plaster, with which it appeared to be perfectly identical, only much whiter, forming a strong contrast to the grey color of the latter; it would not, however, combine with the water in the same manner as fine casting plaster. 2nd. The plaster, burnt by steam during six hours, was, in every respect, equal to the finest plaster of Paris. 3rd. The plaster, burnt during nine hours, was of excellent quality; but did not appear to be in any way superior to that operated upon during six hours only.

M. Violette made another experiment, with the pressure of the steam raised to one atmosphere; by this means, the quantity of steam sent through the apparatus in the course of an hour, amounted to 40 kilogr. (about 80 lbs.), and certainly effected the operation in less time, but not in proportion to the extra expense. It is therefore only necessary to keep up a maximum pressure of half an atmosphere; perhaps a quarter would be sufficient sometimes; at any rate the pressure need only be sufficient to ensure the proper circulation of the steam.

From the preceding statements, it will be seen that, in order to convert 150 kilogr. of stone into stucco or ordinary plaster, it was sufficient to keep it, during three hours, in a current of heated steam, in the proportion of 20 kilogr. per hour; or, in other words, subjecting it to the action of 60 kilogr. of heated steam. Now, admitting (as is the case) that a cubic metre (a little more than a yard) of broken stone weighs 1300 kilogr., and produces 1000 kilogr. of plaster, when burnt, it will be seen that the quantity of steam necessary and sufficient to calcine a cubic metre of broken stone is 520 kilogr. But it must be borne in mind, that the apparatus is double, and that the steam, which has produced its first effect in the first oven, leaves it at a temperature of about 200°, and expends its remaining heat in the preparation of the material in the second. It will be understood that, by this means, the quantity of steam required will be much lessened; in fact, M. Violette says he does not think he exaggerates in stating, that it would be reduced one-third. Consequently, the quantity necessary for calcining a cubic metre of stone, and for producing 1000 kilogr. of plaster in the apparatus, hereafter described, would be 350 kilogr.

It is admitted in practice that, in the furnaces of well constructed steam-generators, 1 kilogr. of coal produces 6 kilogr. of steam. The quantity of coal necessary therefore for burning a cubic metre of stone, will be 58 kilogr. 33.

It has been calculated that, according to the ordinary plan practised in Paris, a hundred faggots of wood, value 30 fr., are required to burn 10 cubic metres of stone. With regard to the novel process, its cost depends solely upon the price of the coal. Now, coal from Charleroy costs, in bulk, outside Paris, 20 fr. 50 per hectolitre, weighing from 85 to 90 kilogr. From Aniche it costs 3 fr. 20. By mixing these two in equal proportions, a fuel, suitable for combustion in furnaces, is obtained, which will cost

26 fr. per 1000 kilogr. 58 kilogr. 33 of coal are required for burning a cubic metre of stone; so that the cost of production of 1000 kilogr. of plaster will be 1 fr. 50. The novel process, therefore, presents an advantage of 1 fr. 49 per cubic metre.

On examination of the important advantages attending this new process, they are found to be as follows:—1st. Superiority and uniformity in the quality of the plaster. 2nd. Superiority in the color,—the improved plaster being a bright white, instead of having the dirty grey tint of common plaster, which is produced by the admixture of coal-dust. 3rd. Facility in the performance of the operation,—as all that is necessary is to heat a steam-boiler. 4th. Economy in the cost of calcination, which will be easily seen on a comparison of the cost of the ordinary calcining operation with the details above given. But perhaps the most important advantage of the novel process is, that the steam may be turned to advantage, as a motive agent, before it is employed for calcination. This may be easily effected, as it may, on making its exit from the cylinder, in which it has exerted its elastic force, be made to enter the coil of steam pipe, in which it is heated, and from which it escapes to the calcining ovens.

In M. Violette's apparatus, in which he proposes to calcine 100 cubic metres per day, the quantity of steam used will be found sufficient to work an engine of 80-horse power, before acting for the purpose of calcining. As 6000 kilogr. of coal, value 150 fr., would be required per day to generate steam for this engine, the fuel for generating steam, for the purpose of calcination, would cost nothing;—by this means, an engine of 80-horse power may be worked free of expense. This advantage is so important, that the expenses of calcination will be next to nothing, if use can be found for the steam power. Now, to say nothing of various uses to which it might be applied, it might be used, not only for breaking the stone and grinding the plaster, but also for pounding the stone for agricultural and other purposes.

The following is a description of an apparatus, which M. Violette has contrived, for operating upon 100 cubic metres per day: —Fig. 1, Plate XVIII., is a vertical section of the apparatus, and fig. 2, is a sectional plan of the same. This apparatus consists of two steam generators *a, a,* capable of supplying an engine of 80 horse power, and furnished inside with a steam-pipe *k*. *c, d, e,* are three fire-brick ovens or receivers, communicating with each other by pipes, furnished with stop-cocks; these receivers are charged through the upper opening *f, f, f,* and discharged by the lower opening *g*.

The operation of the apparatus is as follows:—Suppose the three ovens *c, d, e,* to be filled with stone, and the steam to be first passed into the receiver *c*, and from thence into *d*, the cocks 1, 2, 3, 5, 6, 7, only are opened, the others being closed. The steam, produced by the generators *a, a,* passes along the pipe *h*, into the steam-coil *k*, is there heated, makes its exit through the

pipe *i*, meets with a thermometer on that tube, ascends the tube *j*, through the pipe *v*, into the pipe *l*, and into the top of the receiver *c*, where it passes through the mass of stone, and calcines it; the steam then ascends the vertical bent pipe *m*, passes into the horizontal part *n*, of that tube, enters into the receiver *d*, passes down it, and re-ascends through the vertical bent pipe *o*, whence it escapes into the atmosphere, through a cock fixed on the horizontal part of the pipe *p*. The calcination having been completed, the steam must then be passed first into the oven *d*, and from thence into the oven *e*. For this purpose only the cocks 1, 2, 3, 6, 9, and 10, are to be opened, the others remaining closed. The steam enters the pipe *j*, and through the pipes *q*, and *n*,—passes down through the oven *d*, up again through the pipe *o*, through the tube *p*, into the oven *e*, which it traverses from top to bottom; it then ascends through the vertical bent pipe *r*, and from thence passes into the atmosphere, through a cock on the horizontal part of the pipe *s*. If it be required, after operating in the oven *d*, to pass the steam from the oven *e*, into the oven *c*, which has been re-charged with stone, only the cocks 1, 2, 10, 11, 4, and 5, are opened, and all the others are closed. The steam passes from the pipe *j*, into the pipe *t*, through *u*, into the oven *e*, down which it passes; it then re-ascends through the pipe *r*, traverses the pipe *s*, *l*, and enters the oven *c*, down which it passes; re-ascends through the vertical bent tube *m*, and escapes into the atmosphere, through a cock upon the tube *n*. The operation is in this manner rendered continuous.—[*Ibid.*]

NEW KIND OF AQUAFORTIS FOR ACTING UPON COPPER AND STEEL.

BY M. M. SCHWARZ AND R. BOEHME.

For biting into copper and steel, in the process of engraving upon those metals, the practice has generally been to use nitric acid, more or less diluted with water; but the disengagement of oxide of nitrogen, which necessarily takes place, is very injurious to the engraver. Moreover, the bubbles of gas which adhere to the metal, and which thus prevent the action of the acid in certain parts, require special attention, as they have to be constantly removed by a brush, in order to prevent the regularity and beauty of the lines from being destroyed.

A peculiarity is observable in this aquafortis which has not yet been accounted for, viz., that it always has a greater tendency to eat away the sides of the line than to deepen it; so that great difficulty is experienced when it is required to give sufficient depth to lines of a certain fineness. Moreover, the action of the nitrous acid, which is formed by the absorption of the deutoxide of azote, is often stronger than requisite, although this may be remedied by the addition of urea or creosote. Lastly, the great abundance of the nitric acid which is disengaged, affects the respiratory organs

in a very serious manner. It was therefore thought desirable to find an agent which would not form bubbles, and would be free from the inconveniences above mentioned.

The most simple means of attaining the desired end appeared to the authors to be the employment of that class of salts which combine directly with the metal. Experiments on a small scale having given satisfactory results, they were induced to make known their new agents to artists, in order that they might be submitted to more extensive experiment.

(*a*) *Aquafortis for Copper.*—Take 10 parts of smoking hydrochloric acid of commerce (containing 40 per cent. of dry acid) and dilute it with 70 parts of water; to this add a boiling solution of 2 parts of chlorate of potash in 20 parts of water. A solution is thus obtained which contains a great quantity of disposable chlorine. This may now be diluted with 100 or 200 parts of water, and may be used to bite into even the most delicate work. A deeper engraving may be obtained, either by allowing the liquor to act for a longer time, or increasing the quantity. The slight odour of chlorine given out by this liquor is far from being so unpleasant or injurious as that of the vapour of nitric acid.

(*b*) *For Steel.*—Take 2 parts of iodine and 5 parts of iodide of potassium, and dissolve it in 40 parts of water; a limpid solution is thus obtained, which may be again diluted with 40 parts of water, for the purpose of acting upon the fine lines. The longer this liquor is allowed to act, and the stronger it is, the deeper and sharper will be the lines of the etching. The lines thus produced are well bitten in, well defined, and have good sharp edges; and, however fine they may be, or however close, they will not run into one another. Temperature, so long as it is within the ordinary limits, has no influence on this agent; and as its action is naturally slow, it is useless to endeavour to quicken it.

The liquor which has served, must not be thrown away, by reason of the high price of iodine, but must be mixed with a small quantity of carbonate of potash, filtered, and its action restored by the addition of a small quantity of chloridized water. Artists may at first meet with some slight difficulties of detail in the employment of these biting acids, but they will no doubt soon disappear by a little practice.—[*Ibid.*]

METHOD OF RENDERING IVORY SOFT AND SEMI-TRANSPARENT.

BY M. LE DOCTEUR L. ELSNER.

For some time past ivory has been manufactured in Paris into semi-transparent articles, which, on being plunged into hot water or milk, are rendered soft and pliant, like leather. Necks of children's sucking bottles, rings, and other articles, which it is customary for children to put into their mouths, have been manufactured from this substance with so great advantage, as to have

induced M. Geisler to undertake some experiments in relation thereto. He has found that the ivory articles may be thus prepared, by immersing them in a solution of phosphoric acid, known in commerce as *acid. phosphoric. pur.*, of sp. gr. 1·130, and leaving them there until they become transparent; they are then to be taken out, washed with water, and dried with a soft cloth,—and will, by this means, be rendered as flexible as leather. The ivory hardens again on exposure to the air; but will resume its pliancy on being plunged into hot water. Phosphoric acid of a less degree of concentration has no effect. With regard to the duration of the immersion, this cannot be determined, as it materially depends upon the quality of the ivory.

Experiments have been made with other acids, such as sulphuric, hydrochloric, and acetic acids; but the one above mentioned was the only one found to produce the effect. This action appears to be owing to the dissolving out of a portion of the lime, and the formation of a combination which is less rich in that earth than ivory,—the composition of which is, as is well known, about 3 of phosphate of lime, a little carbonate of that base, and 1 of gelatinous matter. A microscopic observation, made by Oschatz, of ivory, both in the natural state and after being operated upon as above, shews that no alteration was caused in the structure of the ivory, as might have been expected.

[A curious characteristic of ivory has been made known through Mr. Layard's discoveries at Nineveh. In the ruins of one of the excavated palaces, he found some ivory ornaments, in good preservation, although they must have been buried for more than two thousand years; but, on being exposed a short time to the air, they crumbled at a touch. Some specimens of these ornaments were forwarded to the British Museum, where they underwent an examination, which shewed that the gelatinous portion of the ivory had perished; when, however, this was restored, by boiling the ivory in gelatine, its original quality of hardness and durability returned.]—Ed. Lon. Jour.—[*Ibid.*]

ON THE ZINCING OF IRON.

BY M. LE DOCTEUR L. ELSNER.

There are, it is well known, two different methods of coating metals with zinc;—one by immersing in the molten zinc the articles required to be coated; and another by precipitating the zinc from a solution by means of galvanism. The solution most commonly used for this latter process is, a weak solution of oxide of zinc in potash ley.

Numerous experiments have been recently made by M. Riepe, at the laboratory of the Society of Encouragement, at Berlin, on the solution best adapted for this purpose. The following is a summary of the results obtained:—The compounds of zinc employed by M. Riepe were—a solution of sulphite of zinc; a solu-

tion of cyanide of zinc in cyanide of potassium; a solution of the double salt of chloride of zinc and sal-ammoniac (salt for welding); and a solution of hyposulphite of oxide of zinc. The operation appeared to be most successful with the solution of sulphite of zinc, and with the double salt, above mentioned; but, to ensure success, the solution must be weak, and a weak galvanic current must be employed, otherwise the zinc precipitated will again separate from the iron in the form of thin scales: if proper precautions be taken, the operation will succeed perfectly well, and the zinc may, by that means, be laid on as thick as a sheet of paper. It is scarcely necessary to remark, that the article to be coated must be well cleansed previous to performing the operation.

With regard to the preparation of the salts, the following remarks will be found requisite:—The sulphite of oxide of zinc is prepared, by dissolving in water, saturated with sulphurous gas, as much hydrate of carbonate of zinc, recently precipitated, as will completely saturate the water.

With respect to the ammoniacal chloride of oxide of zinc, proceed as follows:—Dissolve one part of zinc in hydrochloric acid, and, to this solution, add one part of sal-ammoniac;—evaporate the liquor and crystallize. The crystals are colorless six-sided prisms, translucid, easily soluble in water, and very easily deliquescent.

Cyanide of zinc, with cyanide of potassium, are comparatively too expensive; and hyposulphite of zinc gives less satisfactory results.—[*Ibid.*]

ON THE EMPLOYMENT OF PLATINUM FOR THE PURPOSE OF PAINTING ON PORCELAIN.

BY M. SALVETAT.

M. SALVETAT states that some three or four years since, in a notice upon a yellow color to be used for painting upon porcelain, he suggested that some fixed compounds might be discovered which would preserve their proper color, and yet bear, without being themselves changed, or changing any color with which they may be mixed, a sufficiently high temperature to melt the fluxes with which they are intimately combined.

M. Salvetat now calls the attention of chemists to a well-known substance, which he is somewhat surprised has not already recommended itself; as it seems peculiarly applicable to the purpose from its infusibility, and from the fact that most chemical agents have no effect upon it even at a high temperature. This substance is platinum; one part of which being mixed, in a state of powder, with three parts of flux, composed of minium 3, sand 1, and melted borax ½, a fine grey color is produced, of a much superior quality to those hitherto employed for painting on porcelain.

When oxides of iron and cobalt, or of cobalt, iron, manganese, or copper, come together in any quantity, in contact with any siliceous matter, capable of melting at the temperature to which it is exposed, the color of the multiple compound, resulting from the fusion, is black, whether the acid of the cobalt be blue or not, or the iron red or brown in the primitive mixture. This is the case, even at the high temperature of crystal furnaces, and also the still higher temperature of glass furnaces.

Upon these reactions, which are well known to chemists, is founded the preparation of grey and black, generally employed for painting on porcelain, crystal, glass, &c. The shade and intensity are varied by varying the respective proportions of the oxides of cobalt, iron, and zinc, and augmenting the proportion of the flux to the grey color (the composition of which has been above described), in order to obtain a lighter grey. Blues are produced with oxides of cobalt and zinc; and the less oxide of iron the colors contain the brighter they will be. Reds are produced by oxide of iron,—ochres by oxide of iron and oxide of zinc; and their shades are purer in proportion as these oxides are free from other oxides, such as those of manganese and copper.

It is therefore very evident that, when the artist wishes to mix some color with blue, red, or ochre, and uses for that purpose the grey or black colors ordinarily employed, he makes a mixture (in proportions of which he is ignorant) of oxide of iron, cobalt, and zinc, the color of which is black, and of which he can only ascertain the depth by great experience; besides, as the tone of the color is, after baking, totally different to what it was when the color was applied (the blue and red colors being altered, and perhaps even disappearing altogether), he cannot give to his picture, before baking, the aspect which it presents after the fire has brought out the glaze; he must, therefore, paint his picture, not according to what it is before baking, but what he knows, from experience, it will be when baked. This is a serious evil, especially in painting figures, or in the reproduction upon porcelain of the works of the great masters, where great perfection in color is required.*

The platinum grey does not possess any of the above inconveniences. As it does not contain any oxide of cobalt, it serves very well for mixing with reds and ochres, without any fear of its giving too great vigour to the shades by the firing operation. As also it does not contain any oxide of iron, there is no fear that by mixing it with blues they will be made darker than is required:

* The facts above stated may be proved by a very simple experiment:—On a ground of white porcelain lay a band of blue color, and bake the porcelain; then across this blue band lay a red one, and bake afresh. After firing, the isolated portions of the bands will be respectively blue and red; but at that point where they cross it will be a grey, perhaps almost a black, which will, however, not partake either of the red or blue color. The result will be the same whichever color is laid on first. The shade will vary according to the thickness of the bands, and the fire to which they are submitted.

as this substance possesses the property of remaining unchanged by the firing operation. As regards its manufacture, this color is easily produced and reproduced, and is always the same in composition and shade. Pure platinum is easily reduced to powder; for this purpose it is only necessary to precipitate a solution of chloride of platinum by sal-ammoniac, in excess, and to apply heat until this latter salt is completely evaporated; by this means the platinum is obtained in the state of grey powder, which may be immediately mixed with the flux in the proportions above stated, and which may be easily ground.

Platinum is not the only metal which would, if treated in this manner, produce a useful color. All the metals which are ordinarily found mixed with it in the state of ore, may, if treated in the same way, answer the same purpose, with the same superiority over the grey of cobalt and iron. M. Salvetat states that he tried for this purpose some palladium and some rhutenium;—palladium furnished a paler grey and rhutenium a redder grey than platinum.

Some time since (says M. Salvetat) a M. Frick had stated that sesquioxide of iridium furnished a black superior to any before known. M. Malaguti, at the national manufactory, at Sevres, verified all the data of M. Frick; M. Robert also made a small quantity; and M. Salvetat states, that in 1845, he himself furnished, for the use of the above establishment, a quantity of 100 grammes of iridium grey, in order that, by daily use, its qualities might be ascertained.

Platinum is, however, preferable to this latter substance, for many reasons. It is less expensive, more easily prepared, and furnishes a better color; and having been upwards of a year in use, its true value has been ascertained by experience.

M. Salvetat states, in conclusion, that platinum grey is now regularly in use in the manufactory at Sevres.—[*Ibid.*]

Scientific Adjudication.

BAXTER'S EXTENSION.

Before the Judicial Committee of the Privy Council.

Whitehall, June 21st, 1849.

Present,—Lords Brougham, Langdale, the Judge of the Admiralty Court, and the Chancellor of the Duchy of Cornwall.

This was an application made by Mr. Serjeant Shee, on behalf of Mr. Baxter, for the prolongation of a patent, granted to him 23rd October, 1835, for "improvements in producing colored steel plate, copper plate, and other impressions." The application was opposed, in person, by a Mr. Leighton, who was formerly an apprentice of the petitioner, on the grounds that the greater portion of the term of Leighton's apprenticeship had been

devoted to the working of the patent process, to the exclusion of his acquiring the other branches of the business; and that, consequently, his knowledge and experience in the art could not be applied if the exclusive right to the use of the invention were still continued to the patentee. After a lengthened enquiry into the value of the invention (which was proved by the evidence of some eminent artists), and the grounds upon which the application for an extension of the original grant was founded; and evidence having been received for and against Mr. Leighton's claims to consideration, the parties present were directed to withdraw. Their Lordships having deliberated for a short time, the Court was again opened, when the following judgment was delivered by Lord Brougham:—

"Their Lordships having heard the statement of the case by Mr. Serjeant Shee, and also the evidence adduced by him in support of it; and having also taken into consideration the evidence on the other side, which went not so much to negative the case of the petitioner as to set up a case against it on a very special ground (of which a word hereafter); their Lordships are clearly of opinion that there is great merit in this invention, that it has been of considerable public utility, and that it has, as yet, been of no pecuniary benefit to the patentee. Without considering whether the amount of the loss is to be set down to his position as an inventor, or to his position as a speculator in the application of the patent—that is, to the trade of a print-seller—it appears, at all events, that he has made nothing by the patent, and therefore we are of opinion that an extension must be given. We consider it is a very useful invention to the public; that it has sufficient ingenuity to shew great merit in itself; and that it is original is past all doubt, from the evidence of the different persons who have been examined,—among others Mr. Carpmael, Mr. W. Baxter, brother of the patentee, who gave very distinct and very important evidence, Mr. David Roberts, an artist of great merit and celebrity, and Mr. Noble, a member of the Society of British Artists, who gave evidence of its being a great improvement, of which Mr. Roberts, in particular, must be a good judge; because, in his very valuable work, 'Egypt and Syria,' he has been in the way of using methods already in use, independent of the patentee's process, of coloring engravings or coloring lithographs; therefore he is a very trustworthy witness, able to throw light on this branch of the case. But their Lordships are also of opinion that the invention is of public utility; because, whatever makes good prints—almost pictures—prints possessing almost the merit of pictures or drawings, easy of access to the common people, is of great utility to the public in every respect. It is a pleasure to the public, and now it is made a cheap pleasure. It is an innocent pleasure, far more harmless than many other pleasures to which they are used to have recourse, and far more refined, and, therefore, of an improving nature to their minds and morals. Whatever tends to good

taste and the refinement of the intellectual nature of the working people must be a very great benefit, not merely to their own happiness, but to their manners and their conduct in society;—therefore their Lordships are of opinion that it is a valuable invention, in every sense, except that it has unfortunately not been of any value to the patentee himself.

"Now, the case set up against him is one which does not traverse at all any of these positions; for it does not deny the originality of the invention, nor its usefulness, nor its having proved useless to the inventor, nor that his family had to advance several thousands to carry it on, partly from his non-success as an inventor, but chiefly from his unfortunate speculations as a trader; but the case set up is this—and it is a peculiar one—it is the first case of the kind I have ever heard of, and it is very peculiar. Mr. Leighton, who entered a *caveat*, and has been heard by himself and his witnesses, says, in effect, 'the case may be very true, but I am in a peculiar position, having been apprenticed to Mr. Baxter by indenture, and I, as well as Mr. Crewe and Mr. Gregory and others, were to be taught the art and mystery of wood engraving in general, in all its branches; instead of which, Mr. Baxter, having occasion for our services in working his patent, gave us moderate instruction in the general branches of wood engraving, by which we were to gain our livelihood, independently of the patent, and chiefly instructed us in the patent process; two-sevenths of our time being employed in learning the general art and mystery of wood engraving, and the other five-sevenths in learning the patent process; and, if the patent is extended, we shall no longer be enabled to gain our livelihood, because we shall be precluded, by the extended patent, from seeking our livelihood by the patent process, and our skill in the other will not be sufficient.' Now, if that were founded in fact, it would have been a case for their Lordships to consider very much; because they might then be under the necessity, in granting an extension of the patent, of laying the patentee under terms towards those apprentices,—supposing that case to have been proved. But two things are to be considered. In the first place, two years out of seven is considerable instruction upon the face of it, and upon the statement we have heard; because, if a person is only instructed in the patent process, and not in general wood engraving, he probably would be quite unable to gain his livelihood, if he sought it as a general wood engraver; but it is totally otherwise in the case of his being instructed to a certain degree; because he not only has benefited by that instruction, but he would learn a great deal to benefit him as a wood engraver while he was learning the patent process; consequently, those two years would have been worth a great deal more than two years, if he had not been working, during the other five, at the patent process. Taking the five years, without the two, he would gain nothing as a wood engraver;—taking the two years that he was working as a wood engraver, without the five that he was at the patent process, he would not learn so

much of wood engraving in those two years as if he were employed, during the five years, at the patent process. That is the first observation that occurs. But the next is more decisive. I was inclined to think I put him to a hardship in suggesting to him to call witnesses; because he would have rested better upon his own statement, proving the facts, as he might have done, by the petitioner's witnesses, although no doubt they would have been open to re-examination by the learned serjeant, and that would have drawn out part of the case, which relieves my conscience from having been the cause of it; but now we have the evidence of Mr. Crewe and Mr. Gregory. Mr. Crewe himself would have been sufficient to damage Mr. Leighton's case very much; for Mr. Crewe, on cross-examination by the learned serjeant, shewed he was a skilful engraver—that he had been employed, in delicate work, by Messrs. Vizetelly and Co.—that he had received 34*s.* a week for six years—that he had been rewarded by a present of a book, or some other matter, to shew he was highly approved of—and that only one other man, besides the foreman, got more than himself: that man got 45*s.* and he 34*s.* a week, certainly very good wages; and there was another man, who got only 30*s.*; and another much less. That did not do much to assist Mr. Leighton's case; but Mr. Gregory made an end of it, inasmuch as the learned serjeant did not think it necessary to put a question to him, or to make any reply to Mr. Leighton's case; for it appears that Mr. Gregory was employed at 8*s.* 8*d.* per day, which is very high wages at any time;—and I must observe, the nature of the work is a very material consideration; one man's services may be much more valuable than another's, because it is so much a matter of a skilful eye and a nice hand in performing the process—things not easily estimated in pounds, shillings, and pence; not like working in brass or iron, or even like a watchmaker, which is all by rule: here it is by the eye, the hand, the touch, the look, the taste; and, consequently, there is the greatest difference between the value of one man's labor and another's; and, if Mr. Baxter had employed ten men, and given them each seven years instruction only at wood engraving, without the patent process, nothing being said or done about it, one man might gain two guineas and a half a week, like Mr. Gregory, another thirty-four shillings a week, and another thirty shillings a week. It is the degree of skill which makes all the difference. I may observe, also, it is very important to consider that neither Mr. Crewe nor Mr. Gregory, one gaining thirty-four shillings a week and the other two guineas and a half a week, ever were employed or ever were taught by any other person than Mr. Baxter, the petitioner and patentee; he alone is the person who furnished them with the means of getting those wages.

"Therefore, upon the whole, it appears to their Lordships, as to the learned counsel at the bar, that it is perfectly clear there is an end of Mr. Leighton's case, and that the patent should be

extended for the period to which their Lordships have come to the resolution of extending it, namely, for five years, without imposing any terms; so that I hope the patentee will have the benefit of the opinion expressed here to-day upon the subject, which will help him in his further proceeding; and my advice to him is, that he, wise by experience, should take the benefit of his patent, *qua* patentee, by selling licenses, and not injure himself by speculating as a print-seller; for a man may be a very skilful inventor, a very fit patentee,—being entitled to get the patent originally, and now to get an extension of the time,—and yet be a very unsuccessful speculator as a merchant or trader. That is the advice I always gave my clients when I was at the bar; one of whom, Mr. Edward Howard, who had a patent for a sugar process, made £160,000 by acting upon that useful advice,—never speculating in sugar refining, but only selling licenses. He was a brother of the late Duke of Norfolk.

"Our advice to Her Majesty will be, to grant an extension of the patent for five years."

Westminster.—(*In Banco.*)

June 25th, 1849.

BEARD *v.* EGERTON.

THIS was an appeal from an action brought against the defendant for the infringement of a patent for taking Daguerreotype likenesses, which had been assigned to the plaintiff by Miles Berry, the patentee of the process. The defendant pleaded a great number of pleas, the material plea being that the specification was bad, and that by following its directions the plates, which were to be silvered over, and prepared in a particular way, to receive impressions, would be useless. Evidence to this effect was given, and it was contended that the objection was fatal. The learned judge (Chief Justice Wilde), who tried the case, thought the objection was fatal, and the jury were directed to find for the defendant, leave being reserved to the plaintiff to move to enter the verdict for him if that direction should be wrong. The Court had now come to the conclusion that the objection then made could not be sustained. In the construction of a patent the Court was bound so to read a specification as to support it, if it could be supported ("Russell *v.* Cowley," 1 Cr. M. and R., 864, "Neilson *v.* Harford," 8, M. and W., 806, "M'Alpin *v.* Albin," 3, C. B., 518). Applying that principle of construction to the specification before them, it seemed to the Court to be free from any obscurity calculated to mislead any person of fair intention, and that the obscurity was cleared away by a fair consideration of the whole specification. The rule, therefore, to enter the verdict in favor of the plaintiff must be made absolute.

Rule absolute.

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1849.

May 26. *William Binnion*, of Birmingham, for a lamp for railway-carriages.

29. *Theodore de Marillac*, of Victoria Mills, Weaste-lane, Eccles New-road, Manchester, for an oil-can spout.

29. *Silas Allen*, of Birmingham, and *James Rait Beard*, of Manchester, for an improvement in braces.

29. *Charles Walker & Sons*, of Little Sutton-street, Clerkenwell, engineers, for an improved hydrant and gas-sluice valve.

29. *Benjamin Cook, Jun.*, of Green-street, Birmingham, for the ever-tight bedstead sacking.

30. *Charlotte Henry*, of 26, Charlotte-street, Islington, for improved anatomical stays.

31. *John Guest*, of Bedford, for a barley-cutting machine.

31. *Halford & Joseph*, of Tipton, for a coke oven.

31. *Thomas Hutchins Pinder*, of 117, High-street, Cheltenham, for a self-adjusting waistcoat.

31. *William Taylor*, of the Globe Foundry, Birmingham, for an improved crushing-roller.

June 1. *Mc Kean, Perkes, & Co.*, of Tower Buildings, Liverpool, for an iron house.

5. *Thomas Thornton*, of 31, Great Carter-lane, London, plumber, painter, &c., for a steam escape.

5. *Ransomes & May*, of Ipswich, for a wrench or spanner.

6. *George Stocker*, of 3, Little Queen-street, Holborn, for an improved knife and fork cleaning machine.

7. *William Couch*, of 20, Skinner-street, City, for a revolving carpet brush.

7. *Edward Bussell Beedle*, of Wokingham, Berks, builder, for a ventilating brick.

7. *Charles Alfred Jordery*, of Cathedral Hotel, St. Paul's Church-yard, for parts of a stock.

7. *Thomas De la Rue & Co.*, of 110, Bunhill-row, London, for an improved envelope.

7. *John Holmes*, of Norwich, agricultural machine manufacturer, for a manure distributor.

7. *John Holmes*, of Norwich, agricultural machine manufacturer, for a self-adjusting horse hay-rake.

9. *Nathaniel Jones Amies*, of Manchester, braid manufacturer, for a hollow braid spindle.

12. *Richard Hervey*, of 8, London-street, City, for an oval chimney-top.

12. *James Macnaughtan*, of 116, Thistle-street, Glasgow, mechanic, for a spindle bearing.

14. *Southgate & Alcock*, of 76, Watling-street, City, for an improved portmanteau.

June 14. *James Hardcastle*, of Firwood, near Bolton-le-Moors, Lancashire, bleacher, dyer, and finisher, for an improved calender for finishing muslins and other goods requiring such process.

15. *Barnabas Urry*, of Vectis Foundry, Newport, Isle of Wight, for an improved horse-rake.

15. *Robinson & Bussell*, of 7, Westmorland-street, Dublin, musical instrument makers, for an improved arrangement of serpentine passages and valves for cornopeans, &c.

18. *Edmund Spiller*, of 98, Holborn Hill, London, for the bachelor's kettle.

19. *William Robinson*, of Mount Pleasant, Leeds, for a mangling and wringing machine.

21. *Robert Frampton*, of 16, Queen-street, Brompton, Middlesex, for a wheel-plate.

22. *Charles Burrell*, of Thetford, Norfolk, for an improved hurdle machine.

23. *William Henry Dupré*, of 14, Charing Cross, Jersey, plumber, for "the defiance wind-guard and true ventilator."

23. *Henry Giller*, of Birmingham, for "the Gillerian stopper for decanters and other bottles."

25. *James Hashold Steere*, of Burton-on-Trent, for parts applied to diaper and shawl-pins.

26. *James Joseph Brunet*, of Canal Iron Works, Limehouse, civil engineer, for refrigerating brasses.

27. *Thomas Eldrid & James Atkinson*, of London, successors to Peter Thorn, whip manufacturers, for "the whip parasol."

27. *Andrew Whytock*, of 2, Quickset-row, New-road, for a shower-bath.

27. *Charles Henry Osborne*, of Birmingham, for "the lady's dress-fastener."

28. *George Smith & John Kemp*, of Birmingham, for a button.

28. *George Smith & John Kemp*, of Birmingham, for a button.

List of Patents

That have passed the Great Seal of IRELAND, from the 17th May to the 17th June, 1849, inclusive.

To Daniel Miller, of No. 186, St. George's-road, in the City of Glasgow, in Scotland, civil engineer, for certain improvements in the mode of drawing ships up an inclined plane out of water; for which mode a patent was granted to the late Thomas Morton, of Leith, ship-builder, on the 23rd March, 1819, and which mode has been commonly known as Morton's slip.—Sealed 18th May.

Elijah Slack, of Orchard-street, in the Burgh of Renfrew, North Britain, gum-manufacturer, for an improvement or improvements in the preparation of materials to be used in the manufacture of textile fabrics.—Sealed 28th May.

John Bethell, of Parliament-street, in the City of Westminster, Gent., for certain improvements in preserving animal and vegetable substances; and also stones, bricks, and articles made of clay and chalk, and plaster, from decay.—Sealed 1st June.

Alexander Munkittrick, of Manchester, in the county of Lancaster, merchant, for an improved composition of matter, which is applicable as a substitute for oil to the lubrication of machinery, and for other purposes,—being a foreign communication.—Sealed 2nd June.

Joseph Deeley, of Newport, in the county of Monmouth, engineer and iron founder, for improvements in ovens, and in furnaces.—Sealed 13th June.

List of Patents

Granted for SCOTLAND, subsequent to May 22nd, 1849.

To Moses Poole, of the Patent Bill Office, London, Gent., for improvements in apparatus for drawing fluids from the human or animal body,—being a communication.—Sealed 23rd May.

William Newton, of the Office for Patents, 66, Chancery-lane, London, civil engineer, for improvements in the Jacquard machine,—being a communication.—Sealed 28th May.

Malcolm Macfarlane, of Thistle-street, Glasgow, copper-smith, for certain improvements in machinery or apparatus for the drying and finishing of woven fabrics.—Sealed 29th May.

Henry Vint, of St. Mary's Lodge, Colchester, in the county of Essex, Gent., for improvements in propelling ships and other vessels.—Sealed 29th May.

Elijah Slack, of Orchard-street, Renfrew, gum-manufacturer, for an improvement or improvements in the preparation of materials to be used in the manufacture of textile fabrics.—Sealed 31st May.

Edward Buchler, of London, merchant, for improvements in the manufacture of boots and shoes; also applicable to other fabrics,—being a communication.—Sealed 5th June.

Jacques Hulot, of Rue St. Joseph, Paris, manufacturer of fabrics, for improvements in the manufacture of fronts of shirts.—Sealed 8th June.

Thomas Greenwood, of Goodman's Fields, London, sugar-refiner, and Frederick Parker, of New Gravel-lane, Shadwell, animal charcoal manufacturer, for improvements in filtering syrups and other liquors.—Sealed 8th June.

William Ironside Tait, of Rugby, Warwickshire, printer and book-

seller, for an improved method or methods of producing outlines on paper, pasteboard, parchment, papier-maché, and other like fabrics.—Sealed 8th June.

Joseph Harrison, of Blackburn, Lancashire, machine-maker, for certain improvements in and applicable to looms for weaving. —Sealed 11th June.

George Simpson, of Buchanan-street, Glasgow, civil and mining engineer, for a certain improvement or improvements in the machinery, apparatus, or means of raising, lowering, supporting, moving or transporting heavy bodies; such improvements being applicable to various useful purposes.—Sealed 11th June.

William Gratrix, of Salford, bleacher and dyer, for certain improvements in the method or process of drying and finishing woven and other fabrics, and in the machinery or apparatus for performing the same; part of which improvements is applicable to stretching woven fabrics.—Sealed 12th June.

Robert Nelson Collins, of Oxford-court, Cannon-street, London, wholesale druggist, for certain improved compounds to be used for the prevention of injury to health under certain circumstances.—Sealed 14th June.

Osgood Field, of London, merchant, for improvements in anchors, —being a communication.—Sealed 14th June.

Francis Alton Calvert, of Manchester, Lancashire, mechanist, for certain improvements in machinery for cleaning and preparing cotton, wool, and other fibrous substances.—Sealed 19th June.

Charles Augustus Holm, of the Strand, London, engineer, for improvements in printing.—Sealed 19th June.

Thomas Harcourt Thompson, of Blackheath Hill, Kent, civil engineer, for certain improvements in apparatus for preventing the rise of effluvium from drains, sewers, cesspools, and other places; and in apparatus and machinery for regulating the levels of waters in rivers, reservoirs, and canals.—Sealed 22nd June.

New Patents
SEALED IN ENGLAND.
1849.

To John Dugdale and Edward Birch, both of Manchester, in the county of Lancaster, tool and machine-makers, for certain improvements in constructing and propelling ships or other vessels. Sealed 31st May—6 months for inrolment.

Moses Poole, of the Patent Office, London, Gent., for improvements in brazing, pressing, separating, cleaning, and bleaching, and in cooling or heating matters; also in pistons, valves, taps, and spring apparatus,—being a communication. Sealed 2nd June—6 months for inrolment.

Henry Trewhitt, of Sunbury Park, in the county of Middlesex, Esq., and Thomas Russell Crampton, of Buckingham-street, in the City of Westminster, civil engineer, for improvements in locomotive, marine, and stationary engines; and also in the connecting apparatus of marine engines. Sealed 2nd June—6 months for inrolment.

Elijah Slack, of Orchard-street, in the Burgh of Renfrew, North Britain, gum manufacturer, for an improvement or improvements in the preparation of materials to be used in the manufacture of textile fabrics. Sealed 2nd June—6 months for inrolment.

William Goose, of Birmingham, in the county of Warwick, manufacturer, for certain improved machinery for manufacturing nails,—being a communication. Sealed 5th June—6 months for inrolment.

William Henry Smith, of Fitzroy-square, in the county of Middlesex, civil engineer, for certain improvements in breakwaters, beacons, and moorings; parts of which are applicable to other purposes. Sealed 5th June—6 months for inrolment.

George Simpson, of Buchanan-street, in the City of Glasgow, North Britain, civil and mining engineer, for a certain improvement or improvements in the machinery, apparatus, or means of raising, lowering, supporting, moving, or transporting heavy bodies. Sealed 5th June—6 months for inrolment.

Samuel Dunn, of Doncaster, in the county of York, Gent., for improvements in constructing tunnels, and in apparatus to be used for such or similar purposes. Sealed 5th June—6 months for inrolment.

Thomas Lawes, of the City-road, in the county of Middlesex, Gent., for improvements in generating steam, and in the means of obtaining and applying motive power. Sealed 5th June—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in stoves, grates, or fire-places, and in warming or heating buildings,—being a communication. Sealed 5th June—6 months for inrolment.

Thomas Jowett, of Burrage House, in Bingley, in the parish of Bingley, in the West Riding of the county of York, stuff manufacturer, for certain improvements in the method of stopping power looms, and preventing injury to the cloth or fabric in the course of being woven. Sealed 5th June—6 months for inrolment.

George Hinton Bovill, of Abchurch-lane, in the City of London, engineer, for improvements in manufacturing wheat and other grain into meal and flour. Sealed 5th June—6 months for inrolment.

Jacques Hulot, of Rue St. Joseph, Paris, in the Republic of France, manufacturer of fabrics, for improvements in the ma-

nufacture of the fronts of shirts. Sealed 5th June—6 months for inrolment.

Daniel Miller, of St. George's-road, in the City of Glasgow, Scotland, civil engineer, for certain improvements in the mode of drawing ships up an inclined plane out of water. Sealed 5th June—6 months for inrolment.

Victor Hippolyte Laurent, of France, engineer, for improvements in looms for weaving. Sealed 5th June—6 months for inrolment.

Osgood Field, of London, merchant, for improvements in anchors, —being a communication. Sealed 5th June—6 months for inrolment.

An extension of Her Majesty's Royal Letters Patent for the term of five years from the 27th day of May, 1849, to Thomas Hornby Birley, assignee of John George Bodmer, the original inventor, for certain improvements in machinery for preparing, roving, and spinning cotton and wool. Sealed 5th June.

Thomas Masters, of Regent-street, in the county of Middlesex, Gent., for certain improvements in the construction and arrangement of apparatus for cooking, for heating, and evaporating fluids, and obtaining decoctions and infusions from certain vegetable and animal matters; parts of which improvements are applicable to certain chemical processes. Sealed 7th June —6 months for inrolment.

Edward John Payne, of Chancery-lane, London, Esq., for improvements in marine vessels, in apparatus for the preservation of human life, and in moulding, joining, and finishing hollow and solid figures, composed wholly or in part of certain gum, or combination of certain gums; also for improvements in dissolving the aforesaid gums, and in apparatus or machinery to be used for the purposes above mentioned,—being a communication. Sealed 7th June—6 months for inrolment.

Robert Wilson, of Low Moor Iron Works, Bradford, in the county of York, engineer, for certain improvements in steam-engines and boilers, and methods of preventing accidents in working the same. Sealed 7th June—6 months for inrolment.

Bennett Alfred Burton, of the firm of Bennett Alfred Burton and Henry Mortimer Burton, of John's-place, Holland-street, Southwark, in the county of Surrey, engineers, for certain improvements in the manufacture of pipes, tiles, bricks, stairs, copings, and other like or similar articles from plastic materials; also improvements in machinery to be employed therein. Sealed 7th June—6 months for inrolment.

John Edward Hawkins Payne, of Great Queen-street, in the county of Middlesex, coach lace manufacturer, and Henry William Currie, engineer, in the employ of the said John Edward Hawkins Payne, for improvements in the manufacture of coach-lace and other similar looped or cut-pile fabrics. Sealed 7th June—6 months for inrolment.

Charles James Anthony, of the city of Pittsburgh, in the United States of America, machinist, for certain new and useful improvements in the means of treating unctuous animal matter. Sealed 7th June—6 months for inrolment.

William Henry Ritchie, of Brixton, in the county of Surrey, Gent., for improvements in fire-arms,—being a communication.—Sealed 7th June—6 months for inrolment.

John Houston, of Nelson-square, in the county of Surrey, surgeon, for improvements in obtaining motive power when steam and air are used. Sealed 7th June—6 months for inrolment.

James Steel, of Horton, in the parish of Bradford, in the county of York, and Benjamin Emmerson, of the same place, overlookers, for improvements in power looms. Sealed 7th June—6 months for inrolment.

Gustave François Picault, of Rue Dauphin, Paris, in the Republic of France, cutler, for improvements in apparatus for opening oysters. Sealed 7th June—6 months for inrolment.

Douglas Hebson, of Liverpool, engineer, for improvements in steam-engines. Sealed 7th June—6 months for inrolment.

Henry Knight, of Birmingham, in the county of Warwick, mechanical engineer, for certain improvements in apparatus for printing, embossing, pressing, and perforating. Sealed 7th June—6 months for inrolment.

Stanhope Baynes Smith, of Birmingham, in the county of Warwick, electro plater and gilder, for improvements in depositing metals, and in obtaining motive power; part of which improvements are applicable to certain other similar useful purposes. Sealed 7th June—6 months for inrolment.

Joseph Samuda, of Parliament-street, in the City of Westminster, Gent., for improvements in obtaining motive power, and the machinery or apparatus employed therein; which machinery or apparatus may be used for raising liquids,—being a communication. Sealed 9th June—6 months for inrolment.

William Preddy, of Taunton, in the county of Somerset, watchmaker, for improvements in watch-keys and other instruments for winding up watches and other time-keepers. Sealed 12th June—6 months for inrolment.

Joseph Wade Denison, of New York, in the United States of America, Gent., for improvements in engines for raising or forcing liquids,—being a communication. Sealed 12th June—6 months for inrolment.

Joseph Burch, of Craig Works, Macclesfield, engineer, for improvements in printing on cotton, woollen, silk, paper, and other fabrics and materials. Sealed 14th June—6 months for inrolment.

Peter William Barlow, of Blackheath, in the county of Kent, civil engineer, for improvements in parts of the permanent ways of railways. Sealed 14th June—6 months for inrolment.

Michael John Haines, of John-street, Commercial-road, East, in the county of Middlesex, leather pipe maker, for improvements

in the manufacture of packing for steam-engines, cylinders, and other purposes; part of which improvements are applicable to the manufacture of waterproof fabrics and leather. Sealed 14th June—6 months for inrolment.

Henry Mills Stowe, of Bermuda, master of the brig "James," for improvements in blocks and sheaves. Sealed 20th June—6 months for inrolment.

Alexander Francis Campbell, of Great Plumstead, Norfolk, for improvements in wheels, ploughs, and harrows, steam-boilers, and machinery for propelling vessels. Sealed 20th June—6 months for inrolment.

William Combauld Jacob, of 5, Bread-street, in the city of London, warehouseman, for improvements in the manufacture of parasols and umbrellas. Sealed 20th June—2 months for inrolment.

Richard Archibald Brooman, of the firm of J. C. Robertson and Co., of 166, Fleet-street, in the City of London, patent agent, for improvements in apparatus for transferring liquids from one vessel to another, and for filling bottles and other vessels with liquids,—being a communication. Sealed 20th June—6 months for inrolment.

Charles James Coverley Griffin, of Southwark, in the county of Surrey, hatter, for certain improvements in military accoutrements. Sealed 20th June—6 months for inrolment.

Edward Lyon Berthon Clerk, Bachelor of Arts, of Fareham, in the county of Southampton, for an instrument to shew the velocity of a ship or other vessel, propelled through the water by wind, steam, or other moving power. Sealed 20th June—6 months for inrolment.

Samuel Colt, of Trafalgar-square, in the county of Middlesex, Gent., for improvements in fire-arms. Sealed 20th June—6 months for inrolment.

Henry Bessemer, of Baxter House, St. Pancras, in the county of Middlesex, engineer, for improvements in the methods, means, and machinery or apparatus employed for raising and forcing water and other fluids. Sealed 23rd June—6 months for inrolment.

Thomas Merchant, of Derby, civil engineer, and Robert Harland, of Derby, carriage builder, for certain improvements in the construction of railway carriages. Sealed 25th June—6 months for inrolment.

George Benjamin Thorneycroft, of Wolverhampton, iron master, for improvements in manufacturing railway-tyres, axles, and other iron, where great strength and durability are required. Sealed 26th June—6 months for inrolment.

Thomas Wood Gray, of Limehouse, brass founder, for improvements in water-closets, pumps, cocks, lubricators, and deck-lights. Sealed 26th June—6 months for inrolment.

James Nasmyth, of Patricroft, near Manchester, engineer, for certain improvements in the method of, and apparatus for, communicating and regulating the power for driving or work-

ing machines employed in manufacturing, dyeing, printing, and finishing textile fabrics. Sealed 26th June—6 months for inrolment.

James Leadbetter, of Kirkby Lonsdale, Westmoreland, brazier, for certain improvements in the method of raising water and other fluids; which improvements are also applicable to the propulsion of machinery, pumping of mines, and other similar purposes. Sealed 26th June—6 months for inrolment.

Walter Neilson, of Hyde Park-street, Glasgow, engineer, for an improvement or improvements in the application of steam for raising, lowering, moving, or transporting heavy bodies.—Sealed 26th June—6 months for inrolment.

Christopher Nickels, of York-road, Lambeth, Gent., for improvements in the manufacture of woollen and other fabrics. Sealed 26th June—6 months for inrolment.

William Wilson, jun., of Campbellfield, Glasgow, Scotland, for improvements in cutting plastic tubes or tiles. Sealed 27th June—6 months for inrolment.

John Thomas Forster, of Plymouth, a Master in Her Majesty's Navy, for improvements in the building of ships, boats, and other vessels; also in the manufacture of boxes, packing-cases, roofs, and other structures requiring to be waterproof. Sealed 27th June—6 months for inrolment.

Edward Woods, of Liverpool, in the county of Lancaster, civil engineer, for certain improvements in turn-tables. Sealed 28th June—6 months for inrolment.

Thomas Beale Browne, of Hampen, in the county of Gloucester, Gent., for certain improvements in looms and in the manufacture of woven and twisted fabrics. Sealed 29th June — 6 months for inrolment.

Bram Hertz, of Great Marlborough-street, in the county of Middlesex, Gent., for improvements in and an addition to fountain pens. Sealed 30th June—6 months for inrolment.

Disclaimer and Amendment

OF PART OF AN INVENTION

MADE UNDER LORD BROUGHAM'S ACT.

Disclaimer entered and filed with the Clerk of the Patents for England on the 26th June, 1849, to part of the title of an invention for which letters patent were granted by Her Majesty on the 12th July, 1847, to Robert William Sievier, of Henrietta-street, Cavendish-square, Gent., for "an improved material or materials for purifying or decolorizing bodies; which material or materials may also be employed as manure and pigments, and for other like purposes."

CELESTIAL PHENOMENA FOR JULY, 1849.

D.	H.	M.	
1			Clock before the ☉ 3m. 27s.
	—		☽ rises 4h. 25m. A,
	—		☽ passes mer. 9h. 15m. A.
	—		☽ sets 1h. 29m. M.
2	20		☽ in Apogee
5			Clock before the ☉ 4m. 11s.
	—		☽ rises 7h. 58m. A.
	—		☽ passes mer. Morn.
	—		☽ sets 3h. 59m. M.
	1	29	Ecliptic oppo. or full moon
6	9	27	♃'s first sat. will em.
7			Occul. 29 Capricorni, im. 16h. 41m.
10			Clock before the ☉ 4m. 58s.
	—		☽ rises 10h. 39m. A.
	—		☽ passes mer. 3h. 33m. M.
	—		☽ sets 9h. 2m. M.
	23	5	☿ stationary
11	19	59	♄ in conj. with the ☽ diff. of dec. 0. 32. N.
	20	41	☿ greatest hel. lat. S.
12			Occul. ƒ Piscium
13	7	8	☽ in □ or last quarter
14	5	20	♂ in conj. with the ☽ diff. of dec. 3. 28. N.
15			Clock before the ☉ 5m. 35s.
	—		☽ rises 0h. 27m. M.
	—		☽ passes mer. 7h. 40m. M.
	—		☽ sets 3h. 5m. A.
16			Occul. α Tauri, im. 3h. 27m.
	—		Mercury R. A. 6h. 20m. dec. 19. 53. N.
	—		Venus R. A. 4h. 28m. dec. 18. 5. N.
	—		Mars R. A. 2h. 44m. dec. 14. 23. N.
	—		Vesta R. A. 5h. 23m. dec. 20. 6. N.
	—		Juno R. A. 9h. 20m. dec. 11. 39. N.
	—		Pallas R. A. 17h. 26m. dec. 22. 26. N.

D.	H.	M.	
16			Ceres R. A. 18h. 12m. dec. 28 43. S.
	—		Jupiter R. A. 9h. 48m. dec. 14. 11. N.
	—		Saturn R. A. 0h. 33m. dec. 0. 56. N.
	—		Georg. R.A.1h.38m.dec.9.34.N.
	—		Mercury passes mer. 22h. 43m.
	—		Venus passes mer. 20h. 51m.
	—		Mars passes mer. 19h. 6m.
	—		Jupiter passes mer. 2h. 11m.
	—		Saturn passes mer. 16h. 53m.
	—		Georg. passes mer. 17h. 58m.
	3	1	♀ in conj. with the ☽ diff. of dec. 1. 32. N.
18	0	14	☿ in conj. with the ☽ diff. of dec. 1. 19. N.
	2	0	☽ in Perigee
	14	15	♅ in □ with the ☉
19	9	15	Ecliptic conj. or ● new moon
20	14	32	♄ stationary
	—		Clock before the ☉ 6m. 0s.
	—		☽ rises 4h. 54m. M.
	—		☽ passes mer. 0h. 40m. A.
	—		☽ sets 8h. 17m. A.
21	11	24	☿ greatest elong. 19. 56. W.
	16	48	♀ greatest elong. 45. 38. W.
22	20	26	♀ greatest hel. lat. S.
24			Vesta in Aphelion
25			Clock before the ☉ 6m. 11s.
	—		☽ rises 11h. 1m. M.
	—		☽ passes mer. 4h. 57m. A.
	—		☽ sets 10h. 42m. A.
27	0	35	☽ in □ or first quarter
29			Occul. B. A. C., 5579, im. 11h. 30m. em. 12h. 36m.
30			Clock before the ☉ 6m. 7s.
	—		☽ rises 4h. 13m. A.
	—		☽ passes mer. 8h. 44m. A.
	—		☽ sets 0h. 34m. M.
	7	0	☽ in Apogee
30	20	16	☿ in the ascending node

J. LEWTHWAITE, Rotherhithe.

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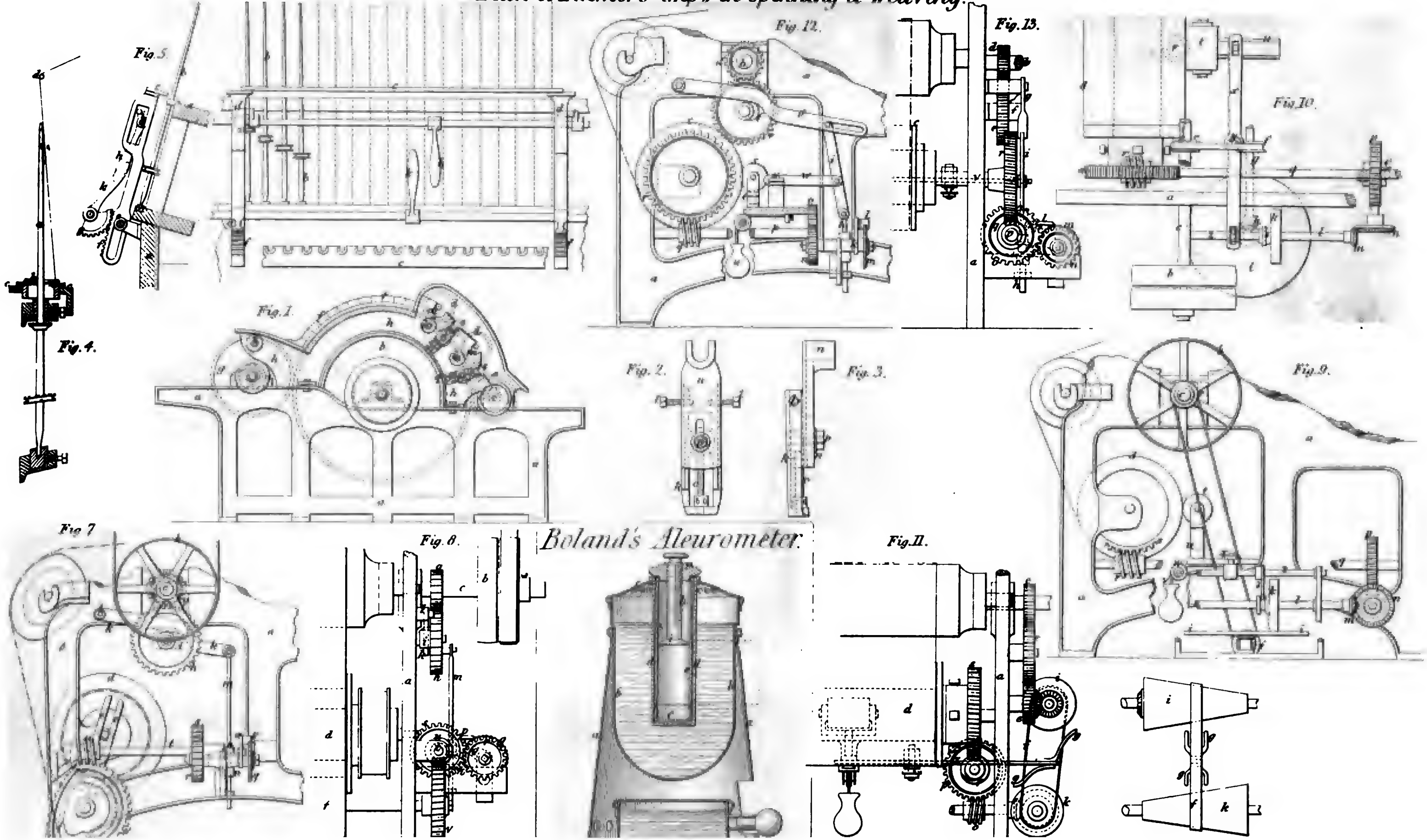
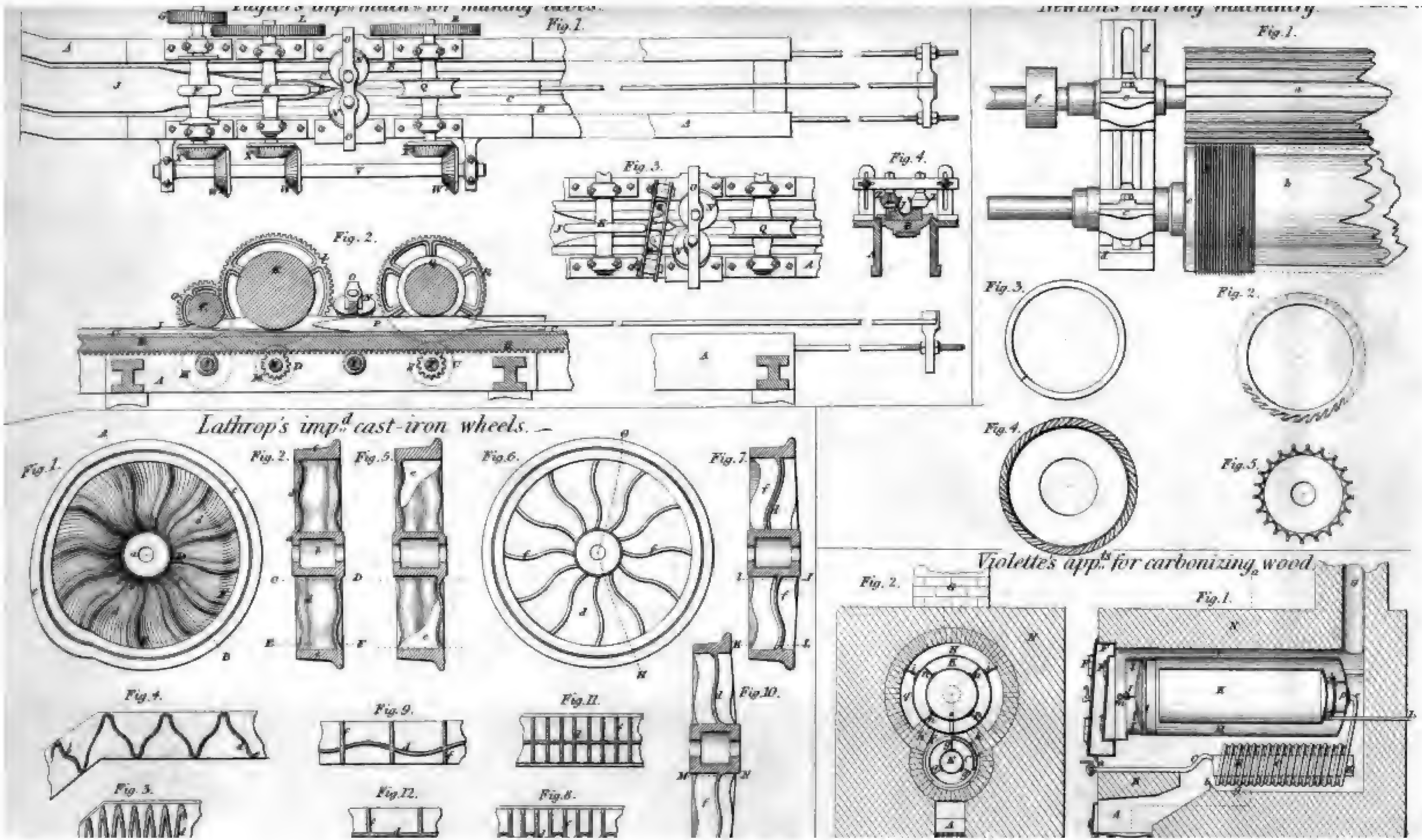
[CONJOINED SERIES.]

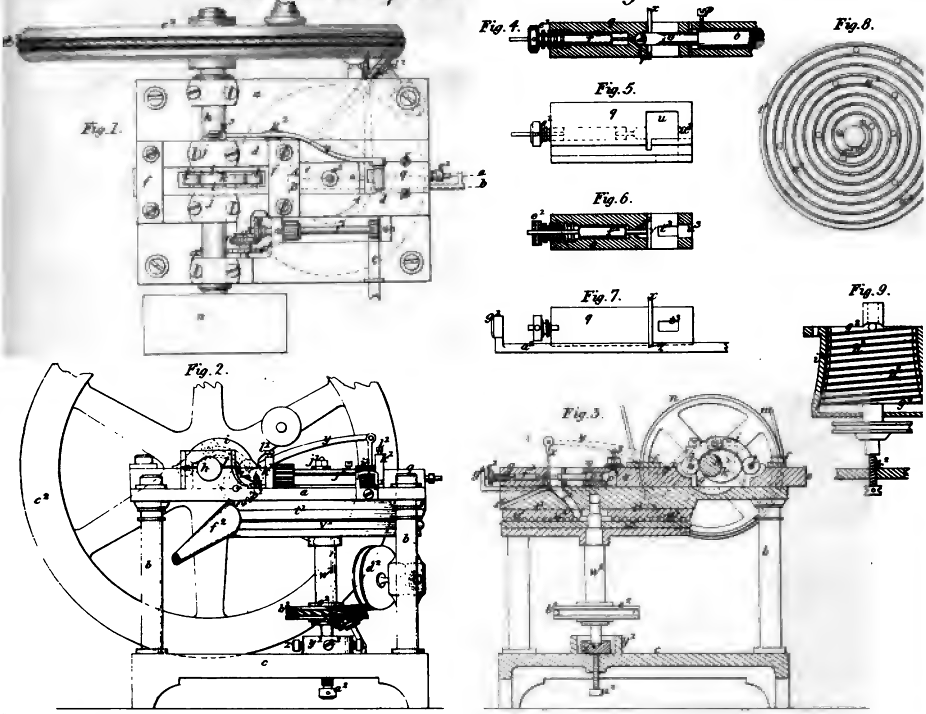
PATENTS, REPORTS OF RECENT.

… imp's in spinning & weaving.

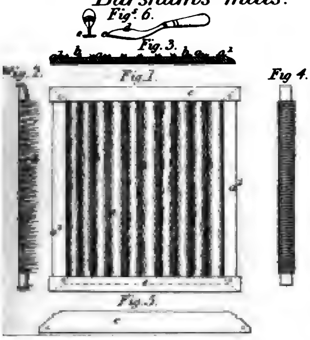



Lathrop's imp.d cast-iron wheels.
Violette's app.ts for carbonizing wood

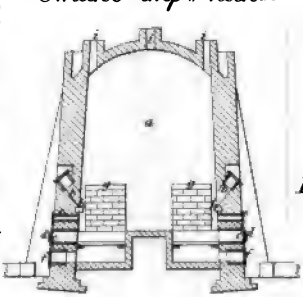
Newton's imp.ts in manufacturing shot.



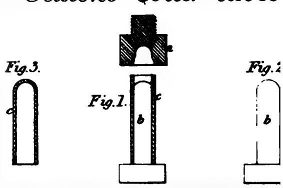
Barsham's mats.



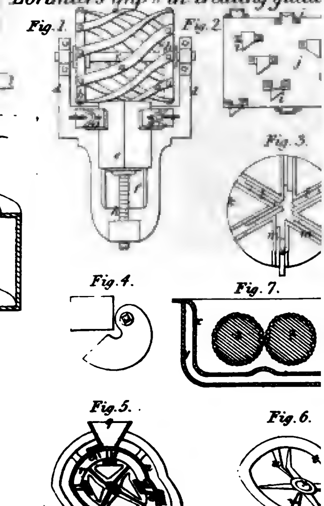
Swain's imp.d kiln.



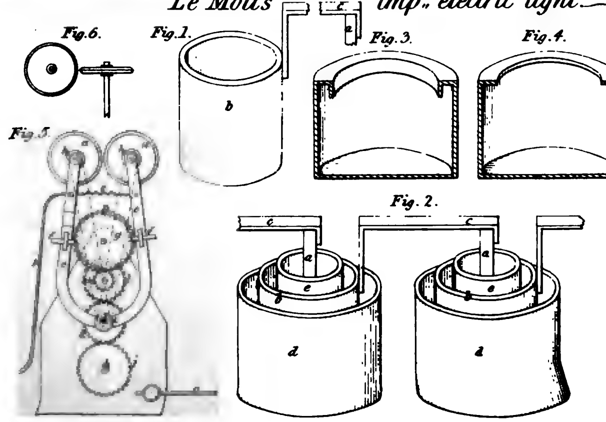
Seaton's boiler tubes



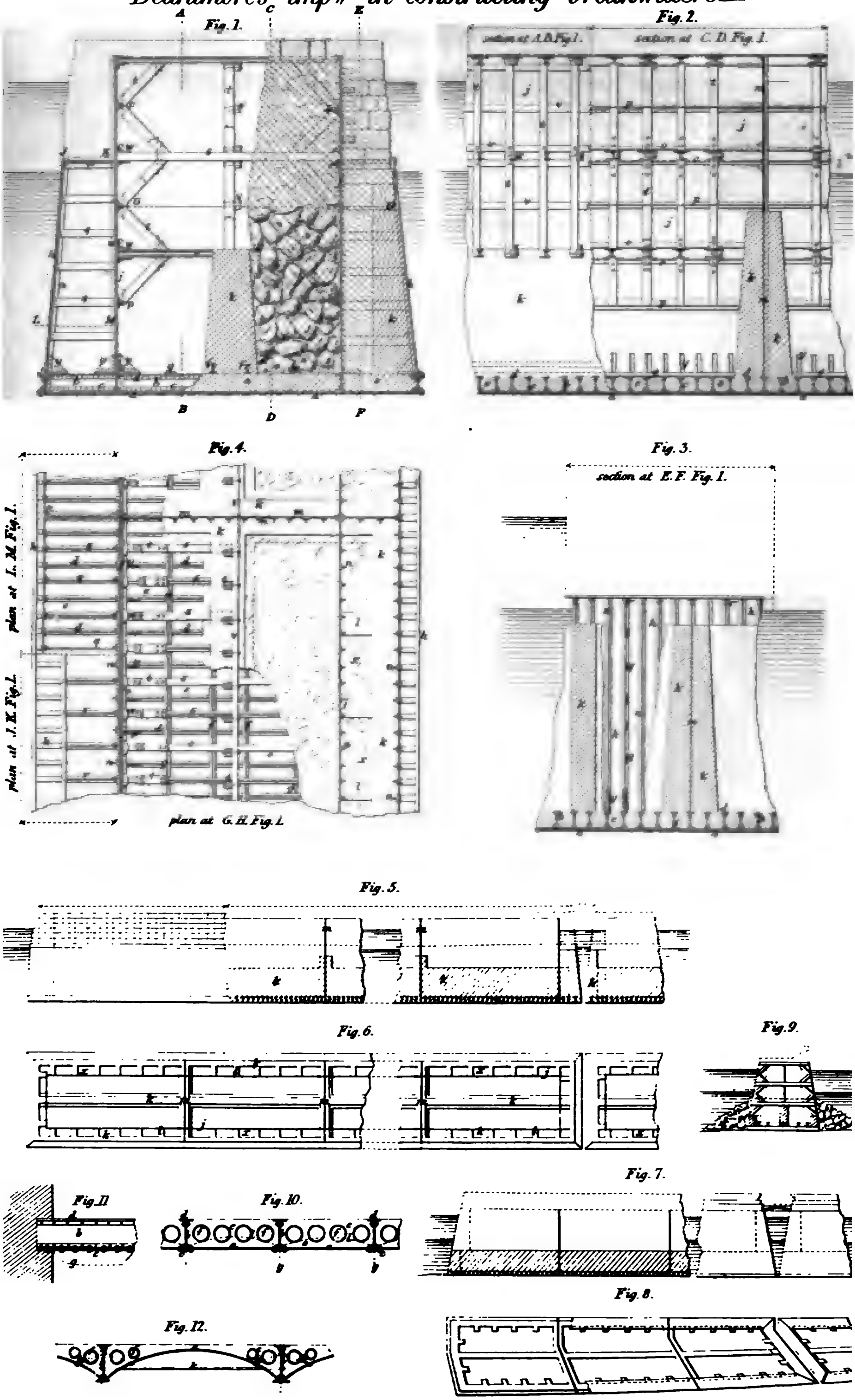
Lorimier's imp.ts in treating gutta



Le Molt's imp.d electric light.



Beardmore's imp^{ts} in constructing breakwaters



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...March 1848

Arrott's impts in manufacturing salt.

Fig. 2.

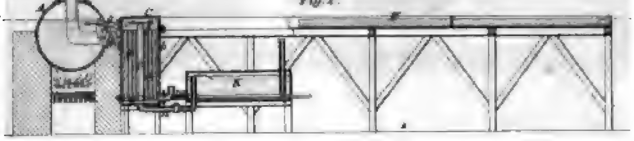


Fig. 4.

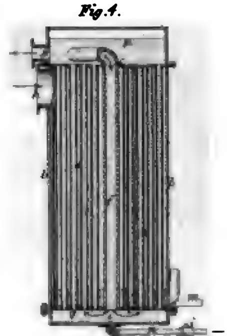


Fig. 1.

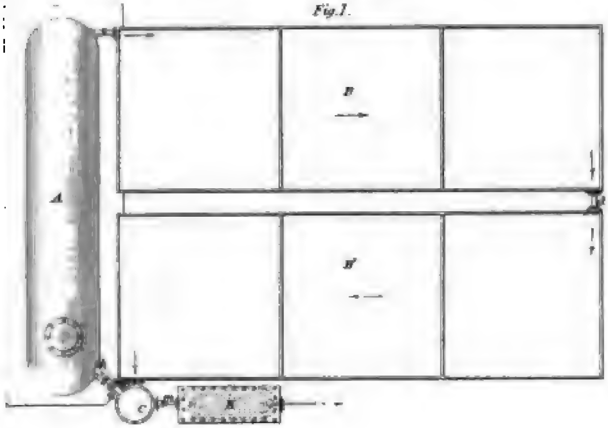
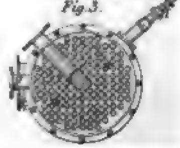


Fig. 3.



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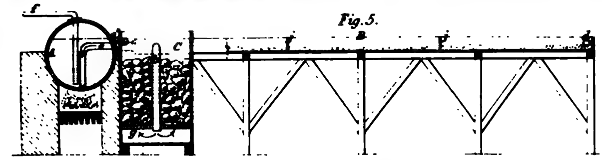
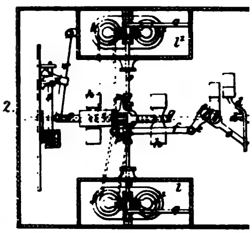


King & Medhurst's imp in gas meters.

Fig. 2.



Hancock's appts for treating gutta percha.

Fig. 2.

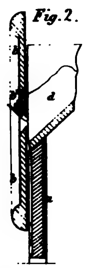


Fig. 1.

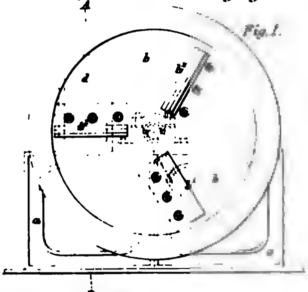


Fig. 5. Fig. 4. Fig. 3.

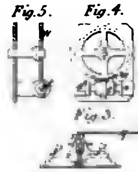
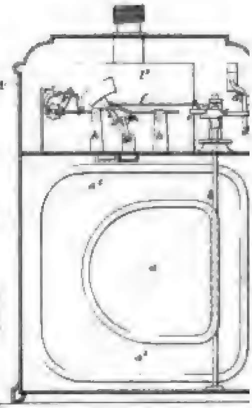


Fig. 1.



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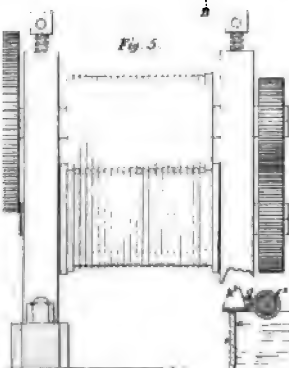

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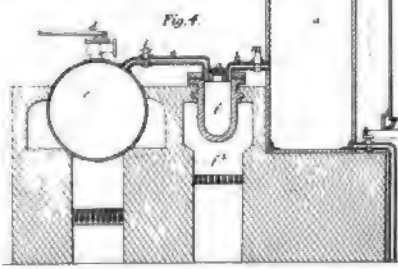
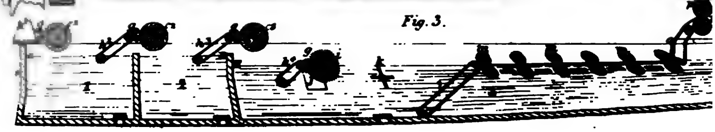
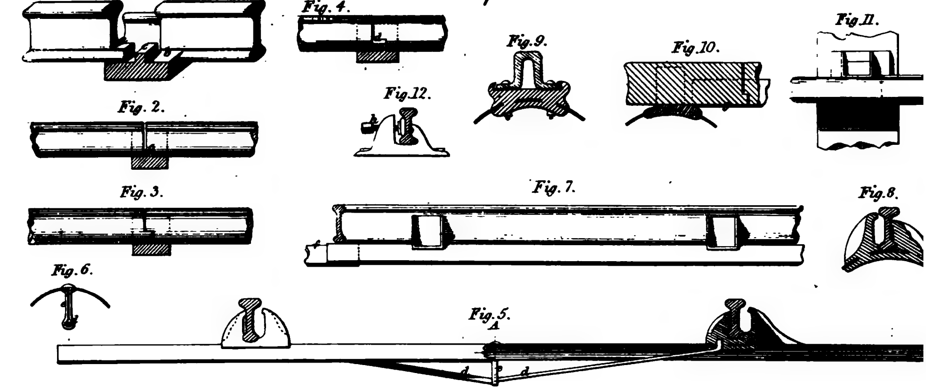


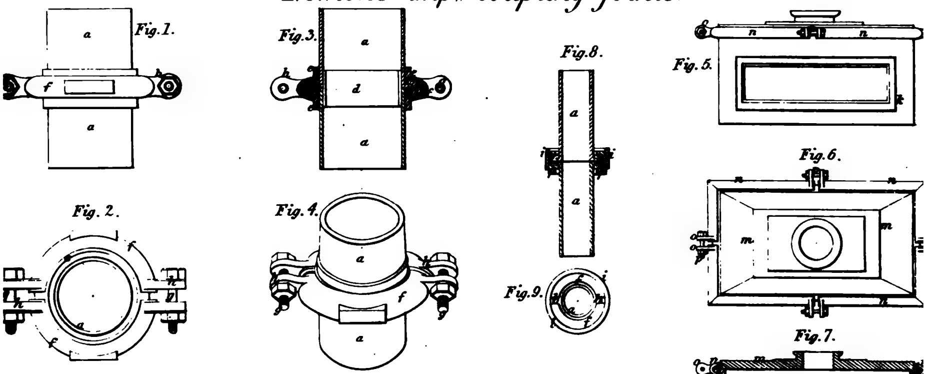
Fig. 3.

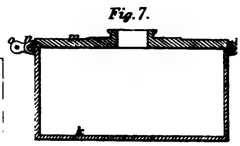


Gordon's imp.ts in rails.

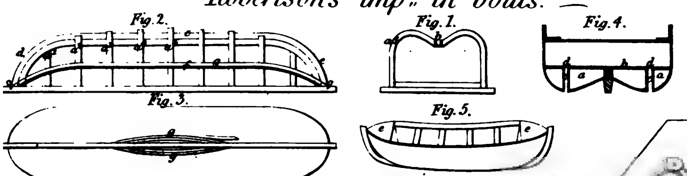


Newton's imp.d coupling joints.

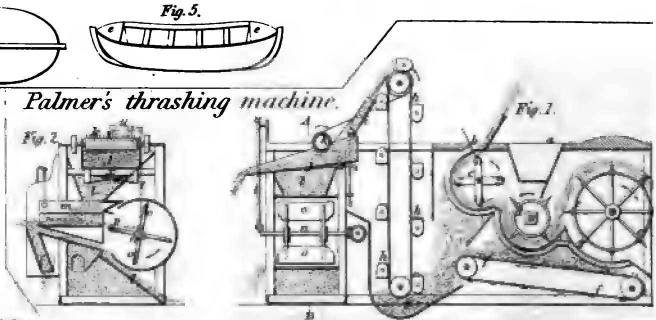




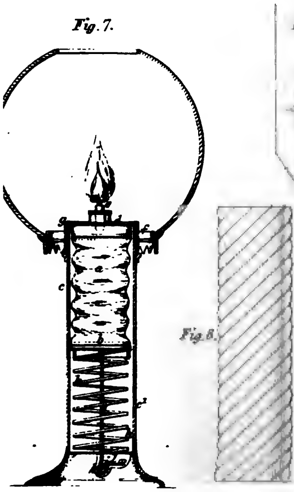
Robertson's imp.ts in boats.

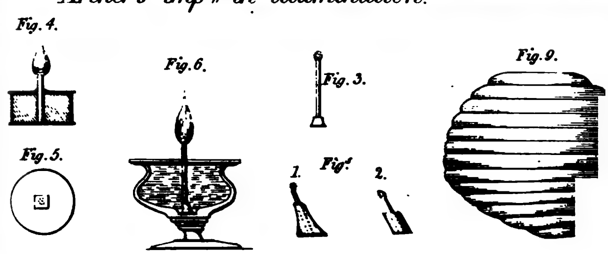


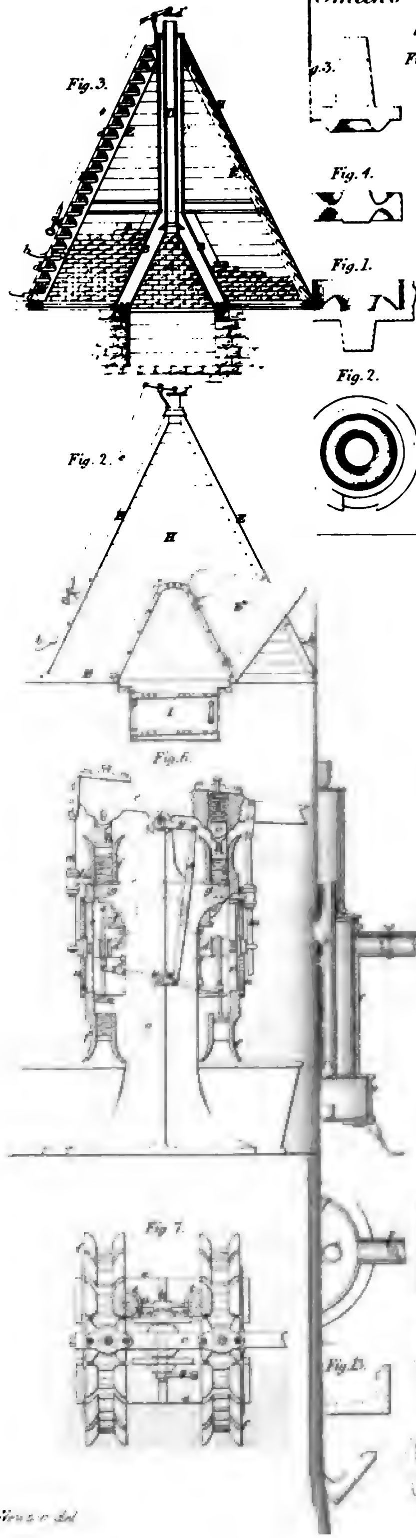
Palmer's thrashing machine.



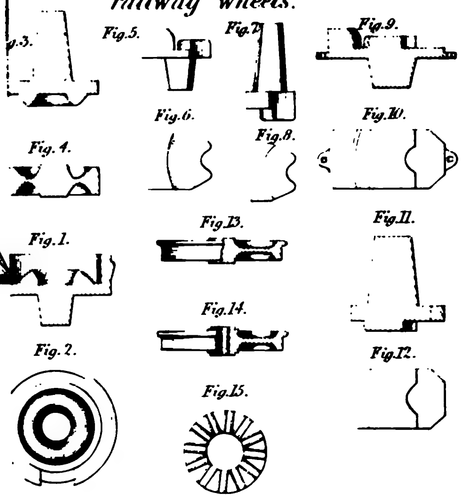
Archer's imp.ts in illumination.



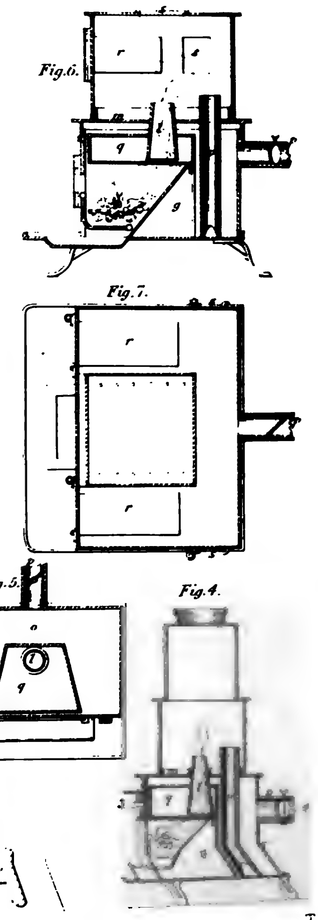




Smith's imp^ts in manufacturing railway wheels.

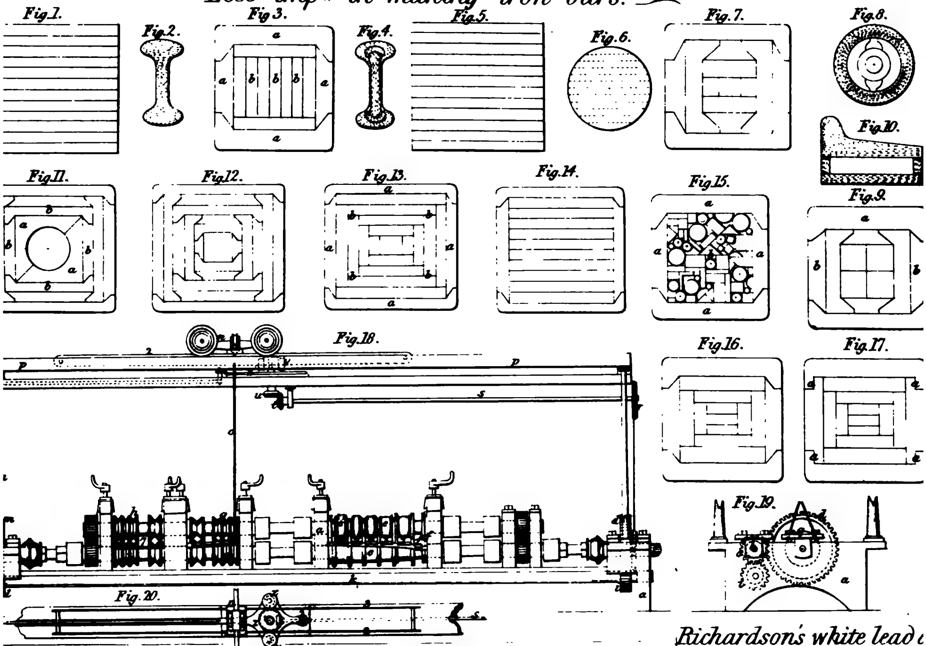


Newton's imp^ts in stoves.

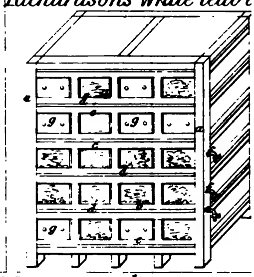


W. Newton del.   T. ...her

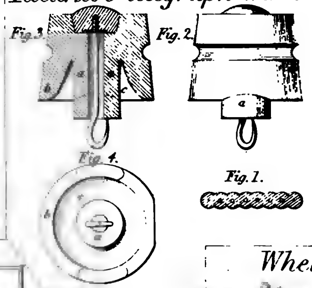
Lees' impts. in making iron bars.



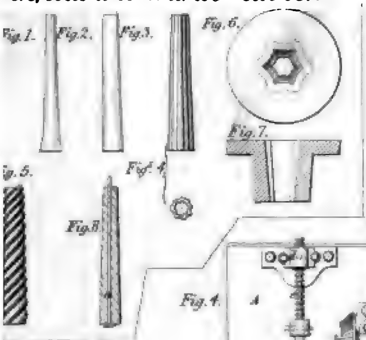
Richardson's white lead



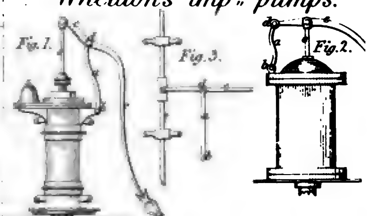
Ricardo's telegraph wires.



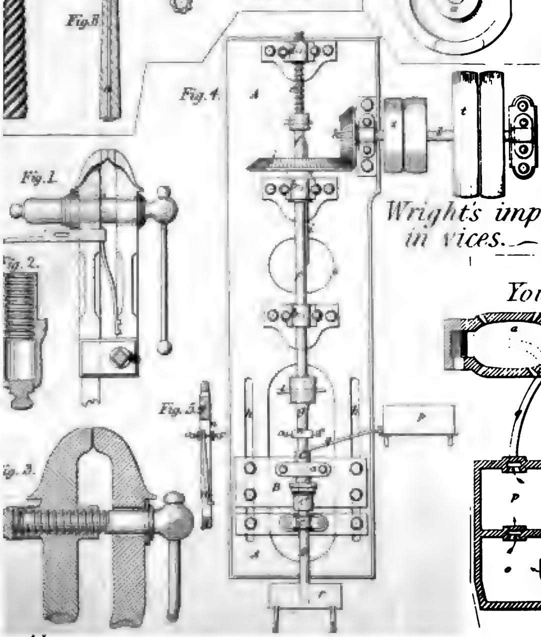
Winfield and Ward's tubes.



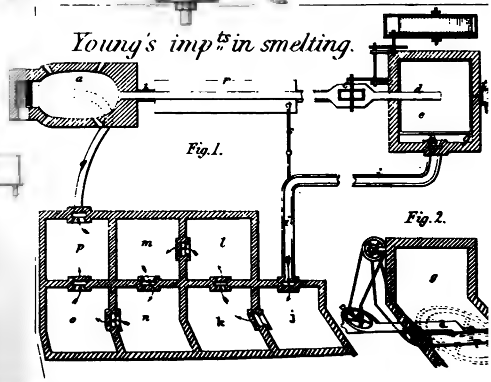
Wheldon's impd. pumps.



Wright's impts. in vices.



Young's impts. in smelting.



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1st April 1849.

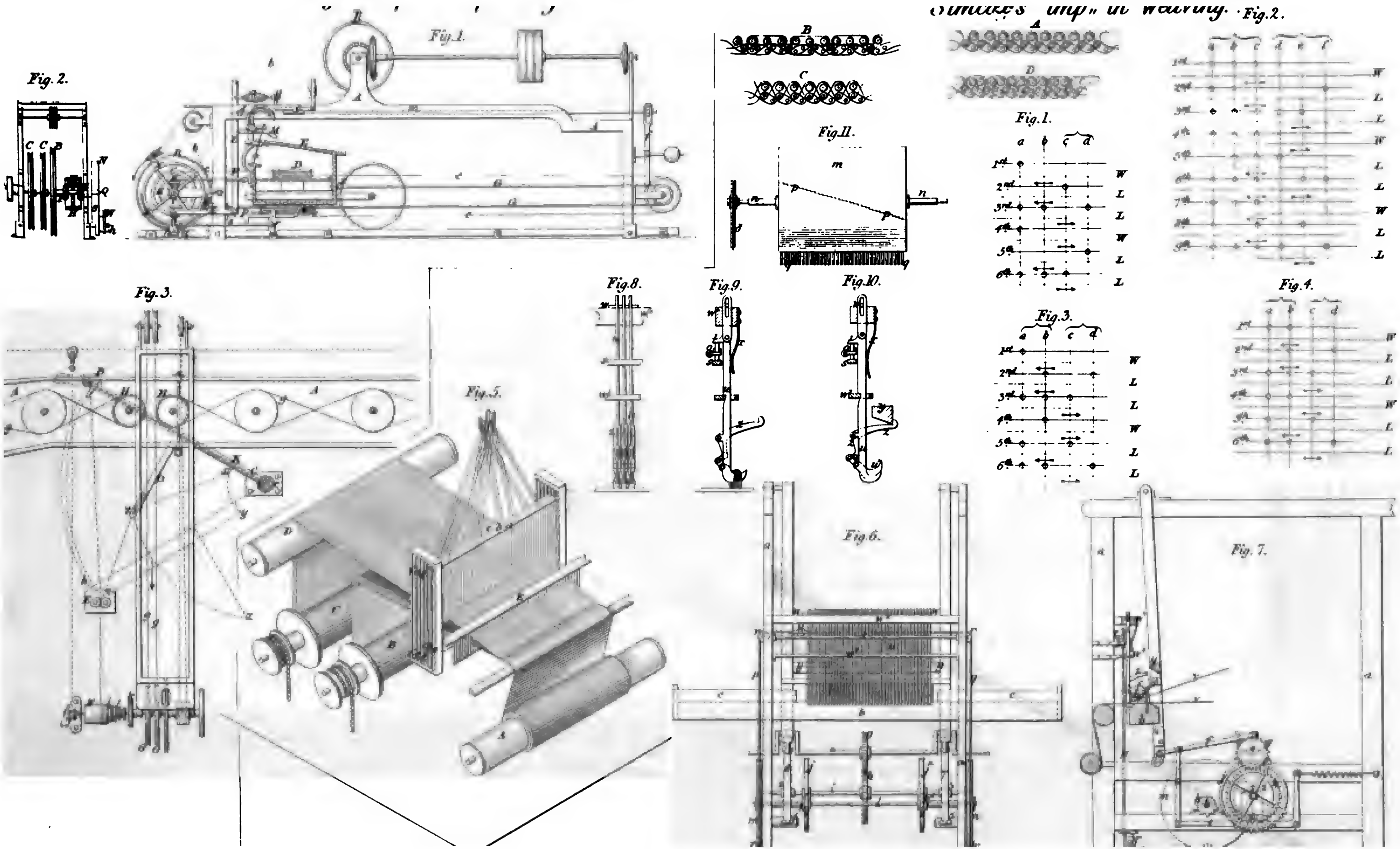
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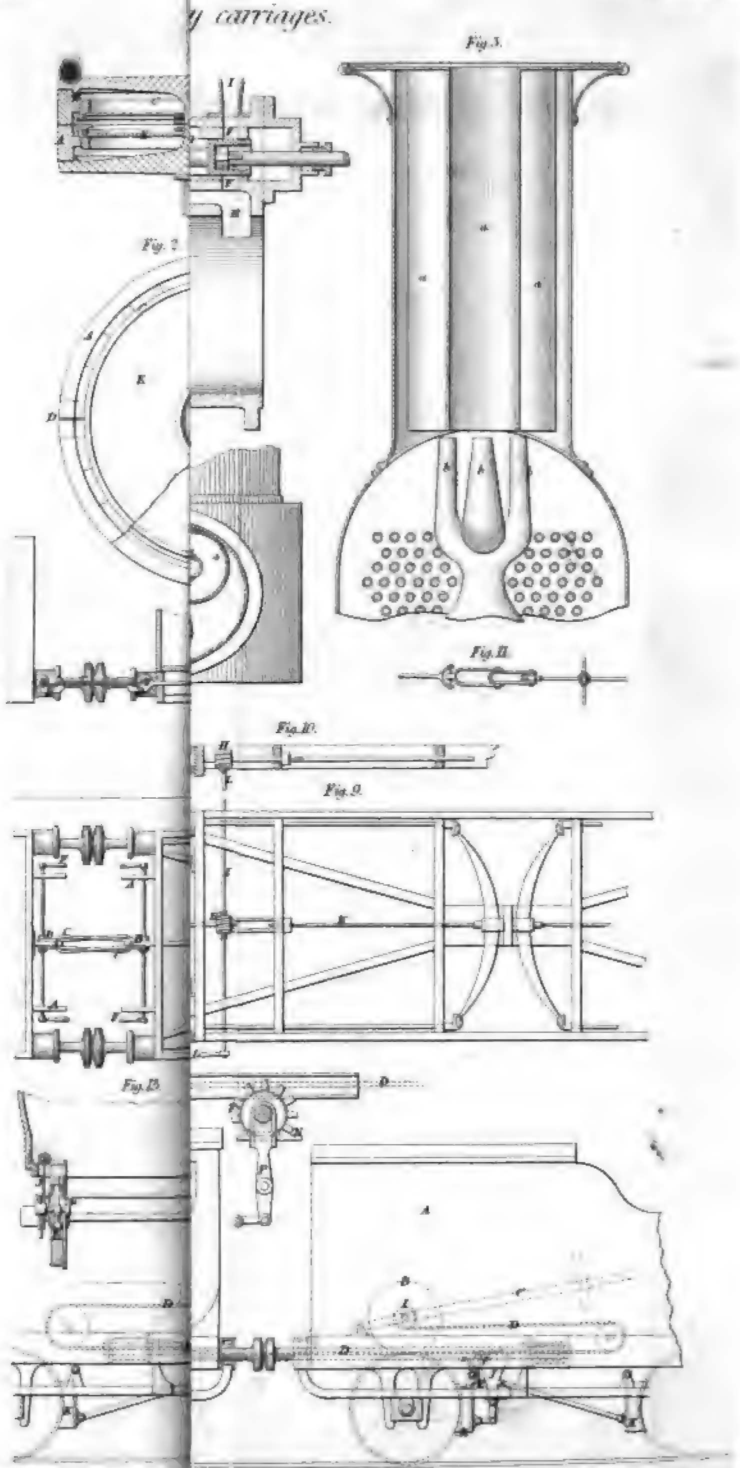
Fig. 4.



W. Newton sc. W. A. Beever

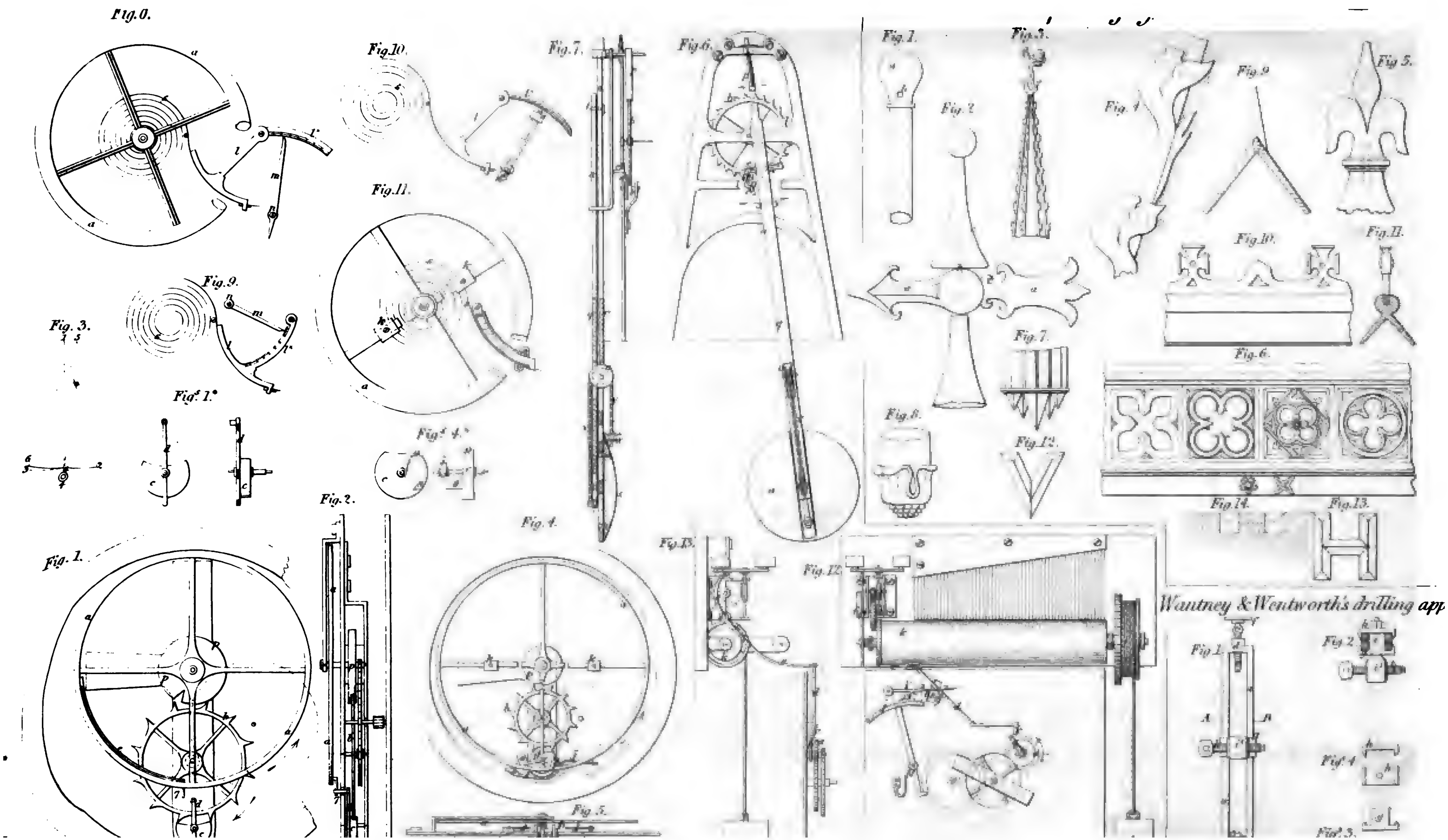

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Fig. 13.
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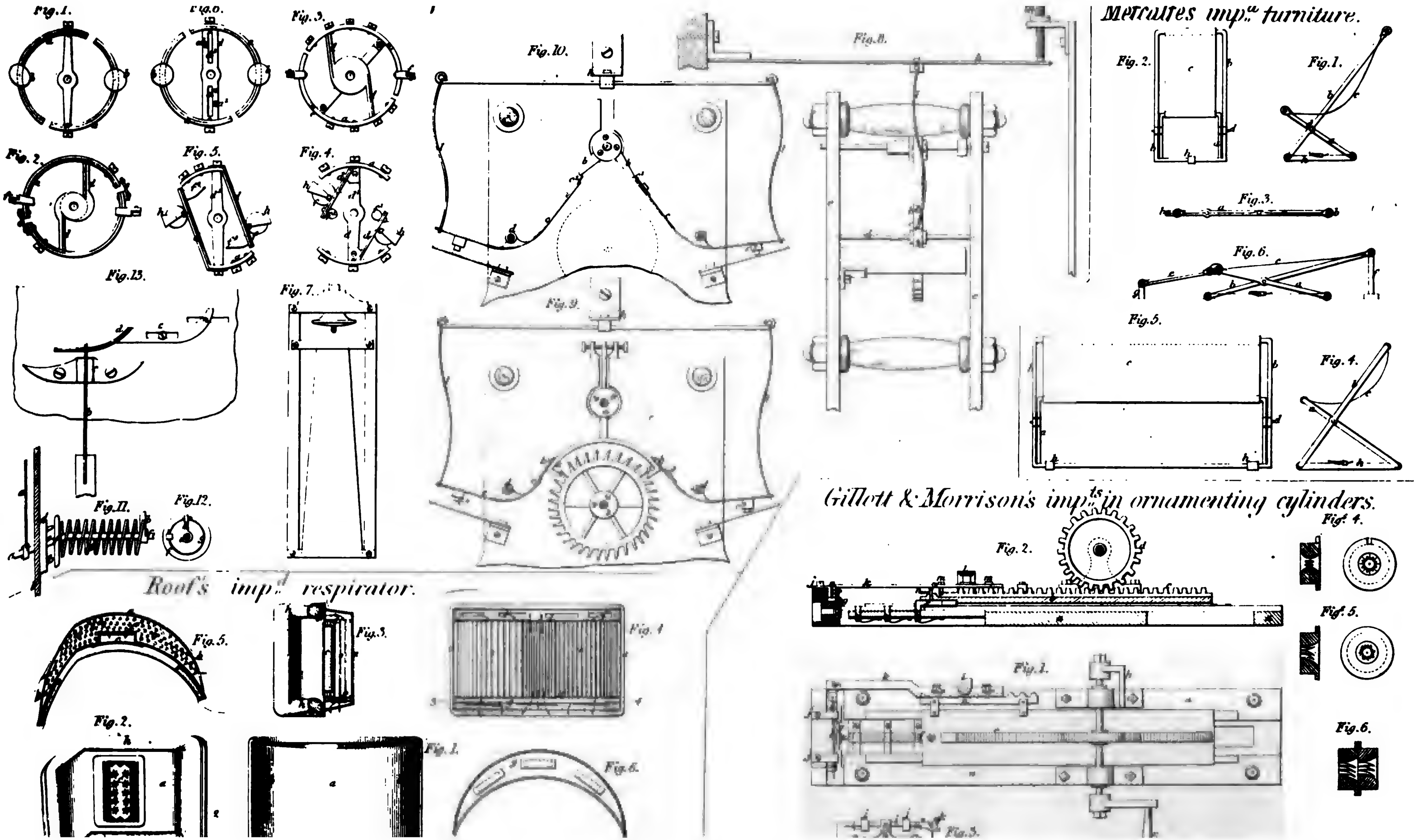
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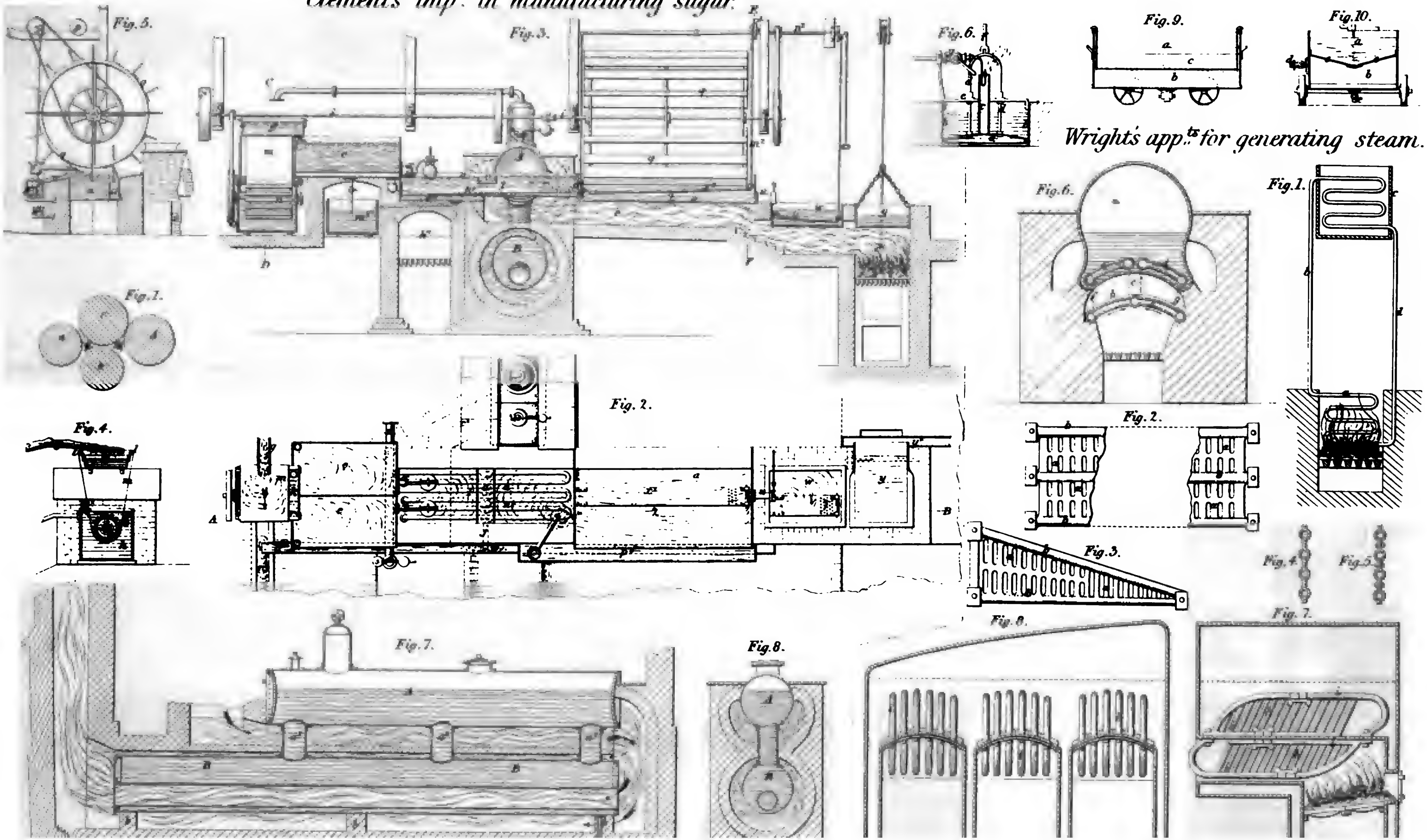
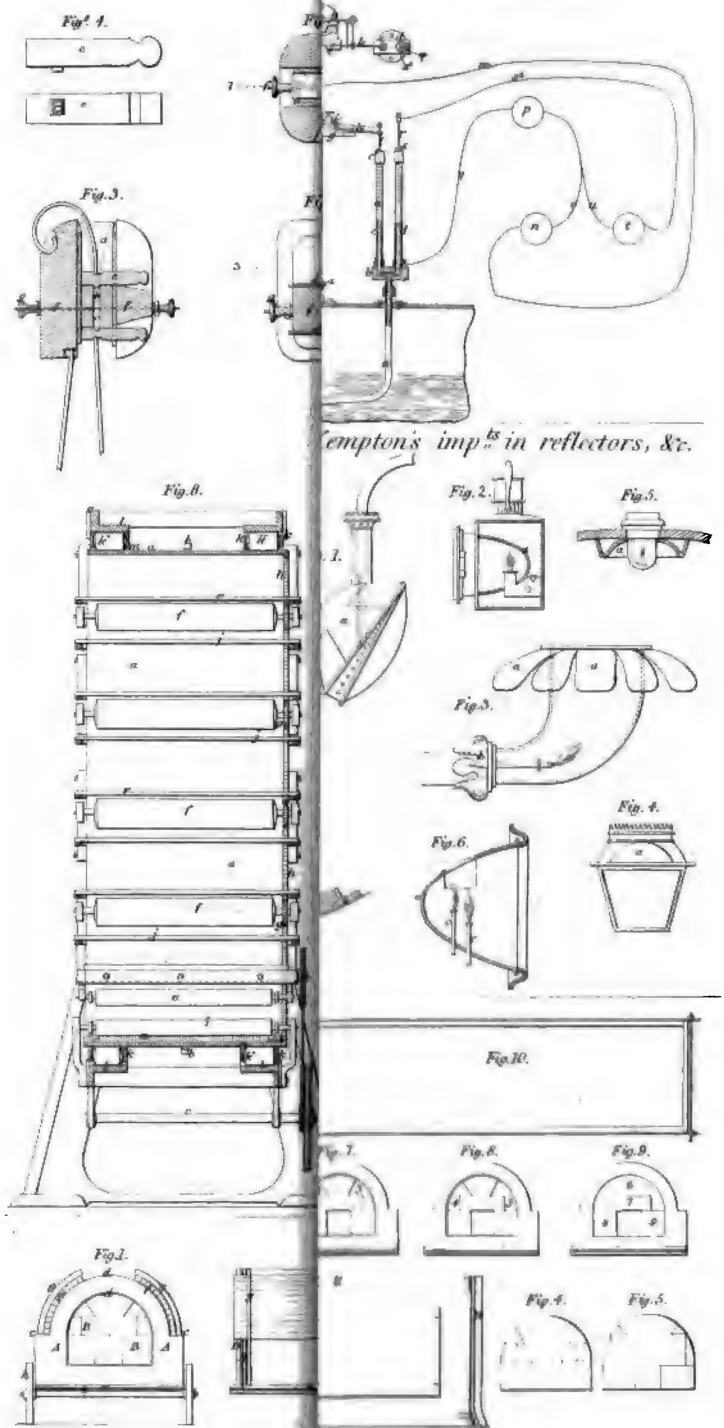
Clement's imp^ts in manufacturing sugar.

Wright's app^ts for generating steam.



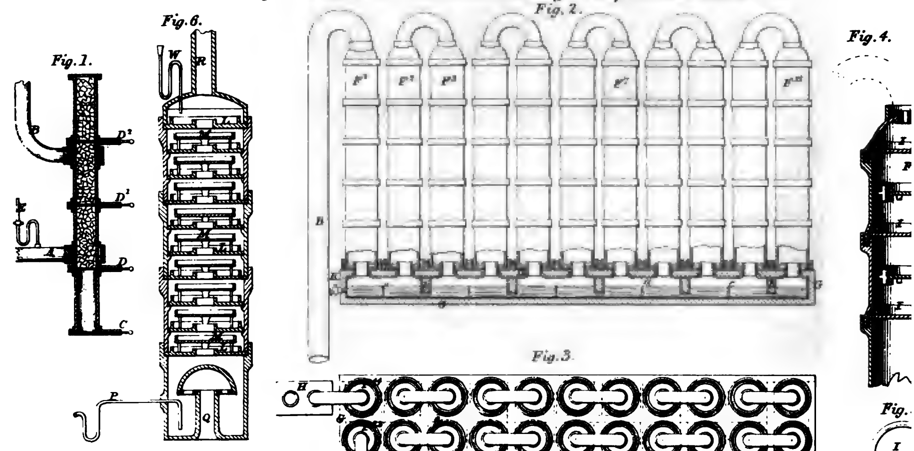
B…steam boiler indicator.

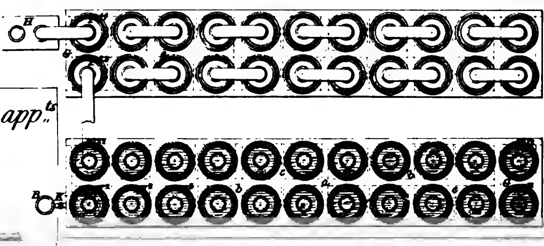
…empton's imp.ts in reflectors, &c.



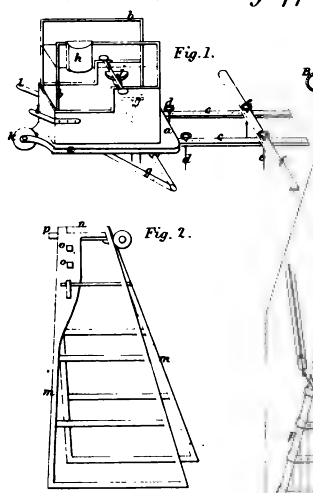
W. Newton del. J. E. Wood sc.

Laming's imp.ts in manufacturing sulphuric acid.

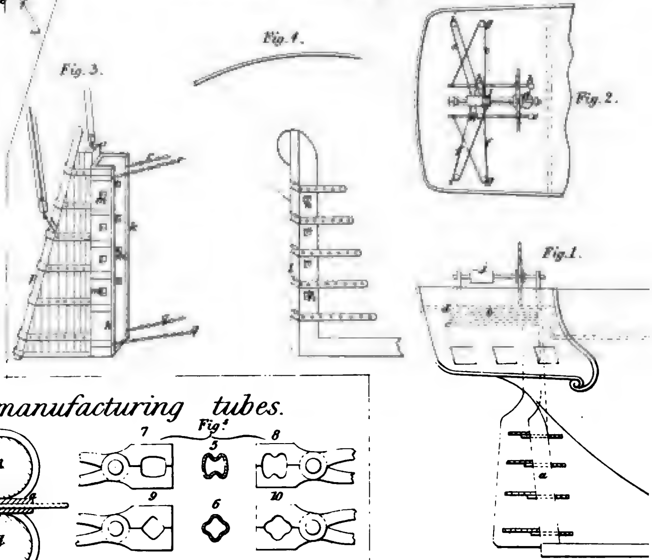




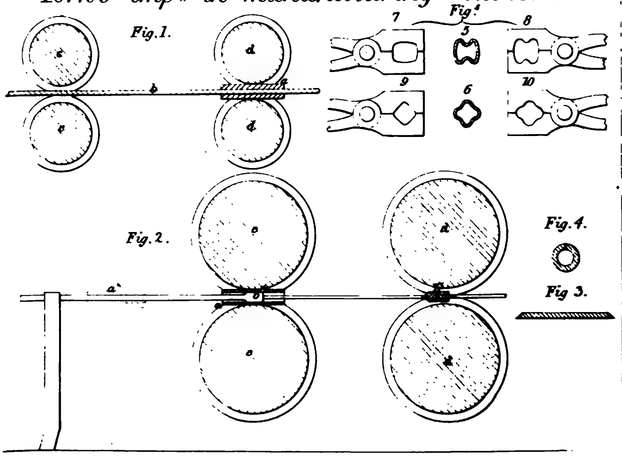
Browne's window cleaning app.ts



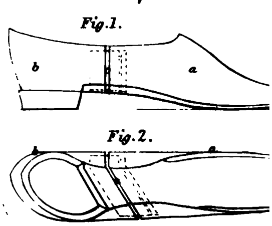
Cullen's steering app.ts

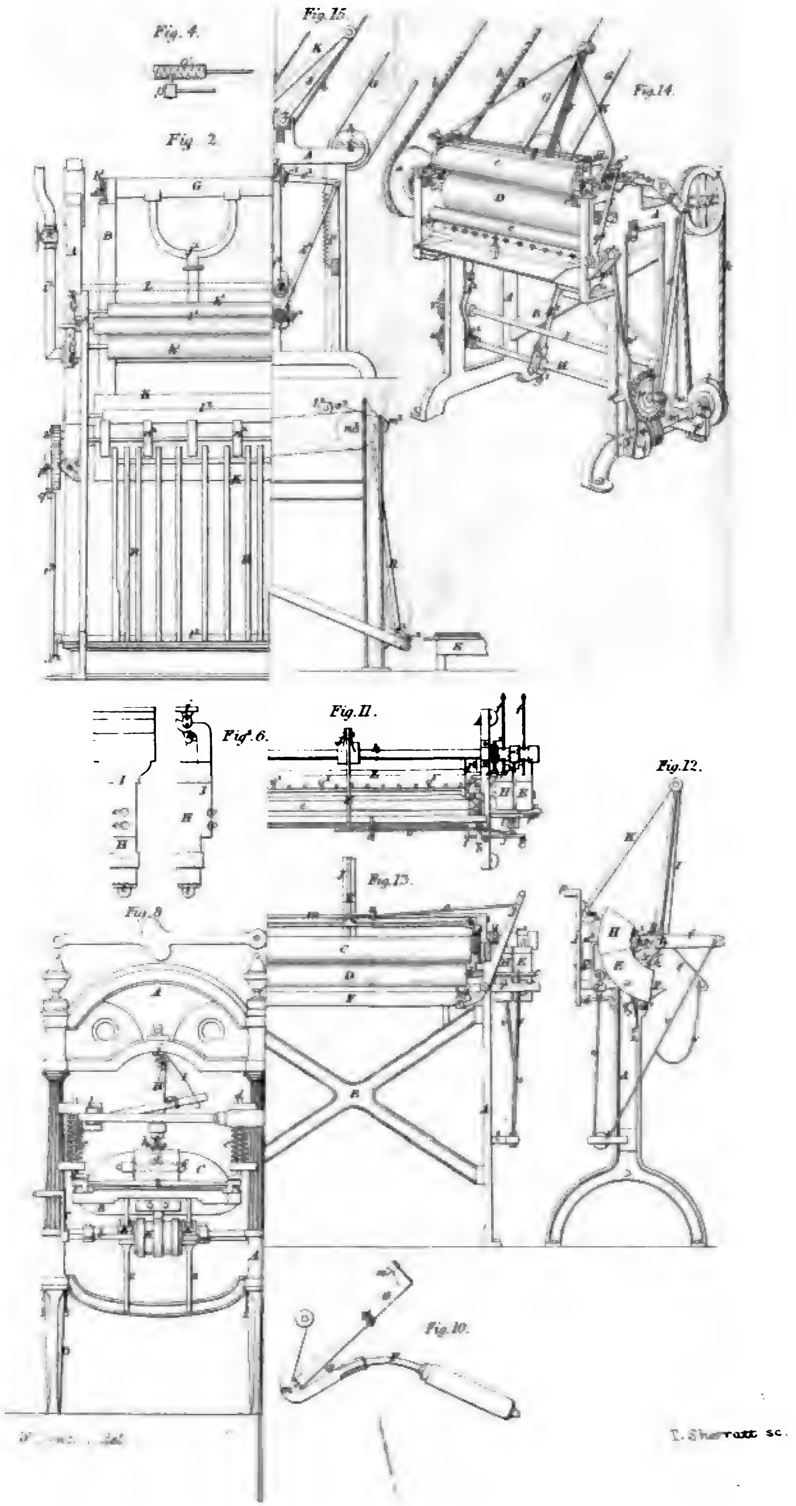


York's imp.ts in manufacturing tubes.



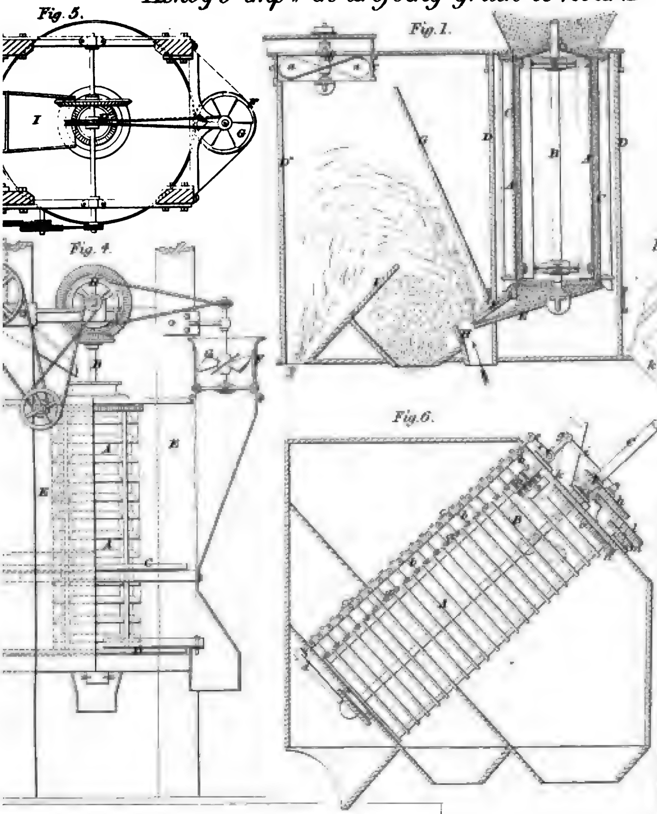
Clark's imp.ts in sho

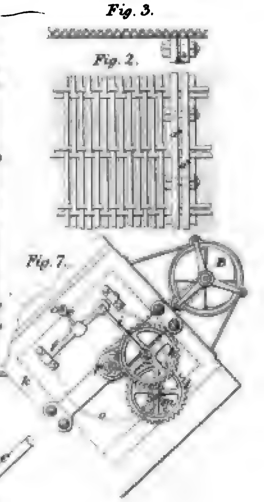




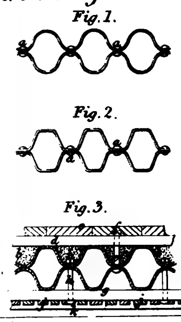
T. Sherratt sc.

Ashby's impts in dressing grain & flour.

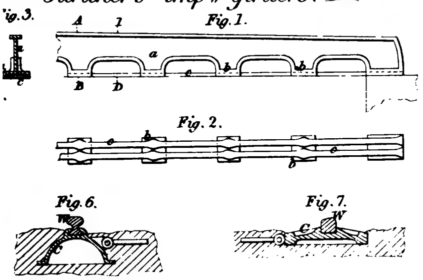




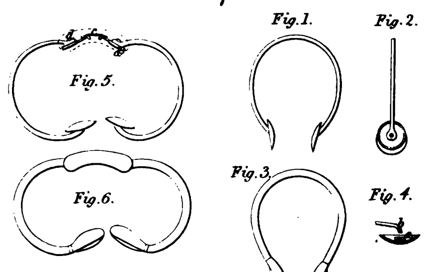
Porter's corrugated beam



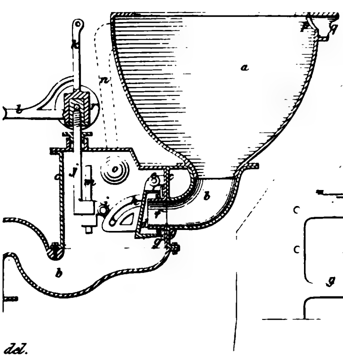
Gardner's impd girders.



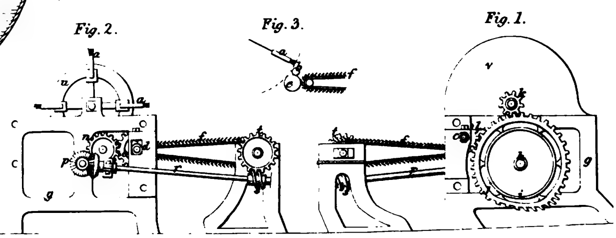
Newson's impd trusses.



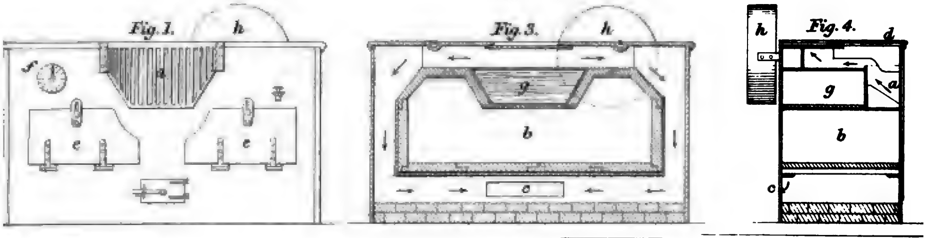
Armstrong's watercloset.

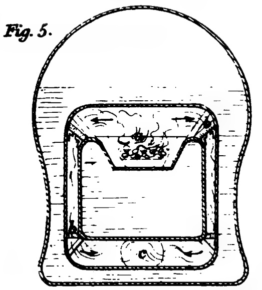


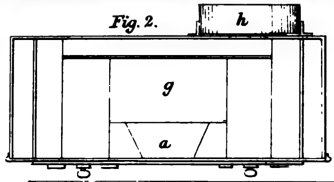
Burn's impts in cotton gins.

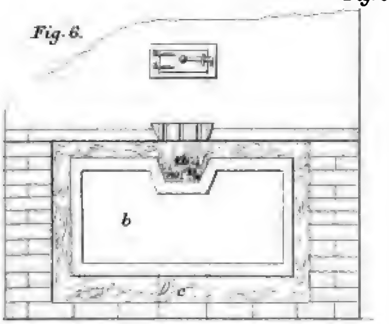


Knowly & Fillis' impts in furnaces.

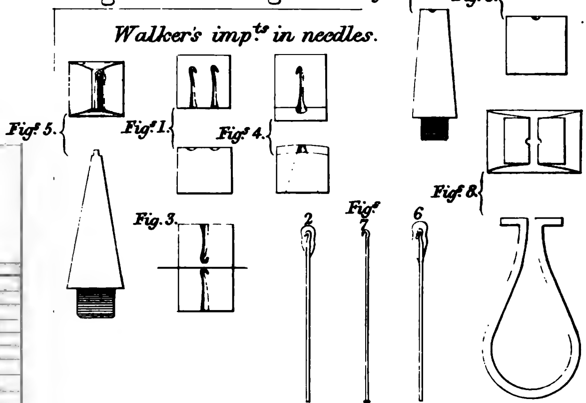




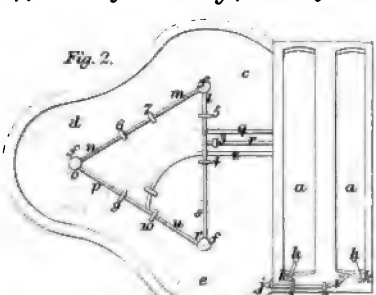


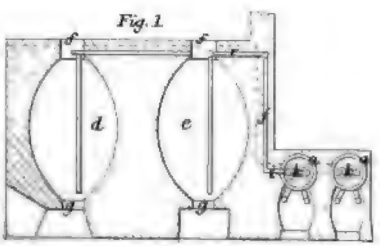


Walker's impts in needles.

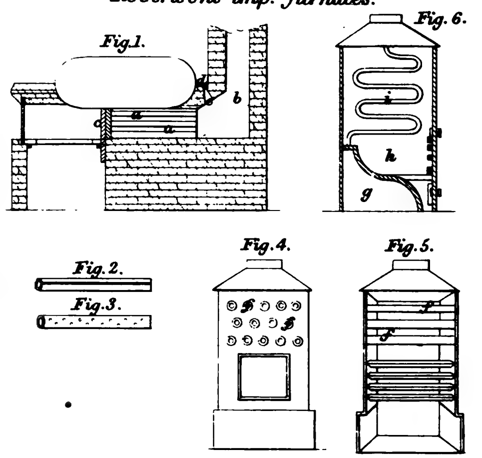


Apparatus for burning plaster of Paris





Robertson's impd furnaces.



Clinton's impd flute.